STOPPING
WATER POLLUTION
AT ITS SOURCE

MISA
Municipal-Industrial Strategy for Abatement

THE DEVELOPMENT DOCUMENT
FOR THE
EFFLUENT MONITORING REGULATION
FOR THE
METAL CASTING SECTOR

Ontario
Environment
Environnement
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THE DEVELOPMENT DOCUMENT FOR THE EFFLUENT MONITORING REGULATION FOR THE METAL CASTING SECTOR

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FOREWORD

The Municipal/Industrial Strategy for Abatement (MISA) program is aimed at reducing discharges of toxic contaminants to Ontario's waterways. The ultimate goal of the MISA program is the virtual elimination of persistent toxic contaminants from all discharges to Ontario's receiving waters.

Under the MISA program, the monitoring requirements for each sector are specified in two regulations - The General Effluent Monitoring Regulation (Ontario Regulation 695/88 as amended to Ontario Regulation 533/89) and the relevant sector-specific regulation.

The General Effluent Monitoring Regulation provides the technical principles which are common to all sectors. It covers the "how to" items such as sampling, chemical analysis, toxicity testing,flow measurement and reporting.

The sector-specific regulation specifies the monitoring requirements of each direct discharger, such as the actual parameters to be monitored, the frequency of monitoring and the regulation in-force dates.

This document contains:

1. An overview of the metal casting sector which includes descriptions of the Ontario Metal Casting Sector plants.

2. The Technical Rationale document for the Metal Casting Sector in Ontario which describes the derivation of the monitoring parameters and the monitoring frequencies that are used in the Effluent Monitoring Regulation.

3. The Effluent Monitoring Regulation for the Metal Casting Sector in Ontario.

4. Explanatory Notes which describe the legal terms used in the Regulation.

The General Effluent Monitoring Regulation, which must be used in conjunction with the sector specific regulation, is published under separate cover. The same document also includes a discussion of the MISA approach to effluent monitoring.

PART I
THE METAL CASTING SECTOR

PART I - THE METAL CASTING SECTOR

I INTRODUCTION

In order to understand the Metal Casting Sector Effluent Monitoring Regulation and the rationale behind its development, a clear understanding of the industry is required. The first part of this development document serves as an introduction to the sector. It defines the metal casting sector, briefly describes the technologies used with respect to both manufacturing and environmental control processes and describes some of the industries.

II SECTOR DEFINITION

The metal casting sector includes those industries that manufacture metallic objects by cooling molten metal in a mold or die. Within this broad definition, a variety of industries exist due to the different metals that may be used, molding techniques employed and finished products produced. The sector can be subdivided into:
-ferrous casters,
-non-ferrous casters,
-die casters and
-foundries,
and even further sub-divided into specific metal groups and casting techniques.

The metal casting sector is represented by three associations:

i) The Canadian Foundry Association (CFA);

ii) The Ontario Chapter of the American Foundrymens Society (AFS);

iii) The Canadian Die Casters Association (CDCA).

The CFA and CDCA are business associations which represent industries. The AFS is a technical society for individuals.

A search of association memberships and government statistics identified over 300 metal casting plants active in Ontario. A complete list of these plants is presented in the Metal Casting Industry Economic Profile (6) listed in the bibliography. A survey of these plants showed that they significantly differ with respect to wastewater generation and disposal practices. Therefore, the plants can be grouped as follows:

a) Those with no industrial wastewater discharge;

b) Those that discharge solely to a publicly owned sewage treatment plant;

c) Those that discharge directly to a surface watercourse.

Group (c) can be further subdivided into the following:

i) Those with a direct discharge of process, storm and cooling water to surface water courses, including lakes, rivers, ponds, streams, reservoirs, swamps, marshes or surface drainage works;

ii) Those with a direct discharge of only storm or cooling water to a lake, river, pond, stream, reservoir, swamp, marsh or provincially owned surface drainage works;

iii) Those with a direct discharge of only storm or cooling water to a municipally owned surface drainage works.

For the purpose of this development document, the metal casting sector includes only those plants in groups (c) (i) and (ii).

Industries in group (a) were excluded since they do not produce industrial wastewater. Industries in groups (b) and (c)(iii) are excluded from this sector since they are included in the MISA sewer use program.

The MISA sewer use program will regulate the discharge of industrial wastewater into municipal sanitary sewers and surface drainage works. Group (c)(i) includes some industries which discharge process wastewater into municipal surface drainage works, however, these industries are included in the metal casting sector, since, it is likely that process wastewater will require the same level of treatment and be subjected to the same limits regardless of whether it is discharged directly to a river, pond etc. or through surface drainage works to a river, pond or any other surface watercourse.

Of the 300 or so metal casting plants surveyed, approximately 175 fall into group (a) (no industrial discharge), 100 into group (b) (indirect dischargers) and 25 into group (c) (direct dischargers). Of the 25 in group (c), thirteen plants fall under groups (c)(i) or (ii). These plants currently form the metal casting sector.

The thirteen plants are as follows:

Acustar Canada Inc. - Etobicoke

The Bowmanville Foundry Company Limited - Bowmanville

Canada Alloy Castings, Ltd. - Kitchener

Canada Pipe Company Ltd. - Hamilton

Crowe Foundry Limited - Cambridge

Indusmin, Division of Falconbridge Limited - Orillia

Ford Motor Company of Canada Limited - Windsor

Franklin Electric of Canada, Limited - Strathroy

General Motors of Canada Limited - St. Catharines

Haley Industries Limited - Haley Station

Magalloy Limited - Stratford

Richmond Die Casting Ltd. - Cornwall

Western Foundry Company Limited - Wingham

These thirteen plants belong to the following Standard Industrial Classifications (SIC):

332 - Iron and Steel Foundries

336 - Non-Ferrous Foundries (Castings)

III PRODUCTS

The range of products manufactured by the metal casting sector is extremely large. Products range from large industrial machine parts weighing several tonnes to small electrical components weighing a few grams. These products are made from various metals including steel, malleable iron, ductile iron and grey iron in the ferrous category and aluminum, copper, magnesium and zinc and their associated alloys in the non-ferrous category.

Some of the more notable products include automotive engine and transmission parts, aircraft parts, pumps, pipes and pipe fittings, industrial machine parts, construction materials, railway parts, agricultural equipment, electrical components and tools.

IV PROCESSES

In any given metal casting operation, there are several basic processes. Metal must be heated to a molten state, introduced into a mold, removed from the mold and finished into the final product.

Many melting techniques are used including cupola furnaces, electric arc furnaces, induction furnaces, reverberatory furnaces and crucible furnaces. The type of furnace depends on the metal charge and desired end product.

A cupola furnaces consists of a refractory lined vertical cylinder. Alternate charges of metal, coke and limestone are introduced to the cupola from the top. Combustion air for the coke is supplied at the bottom. The burning coke provides the heat to melt the metal charge. Molten metal and slag are removed from the bottom of the cupola. Slag is usually dropped into water for rapid cooling and granulation. Air emissions from cupolas consist of metal particulate, coke, limestone, ash, sulfur compounds and carbon monoxide. Cupola furnaces are normally used to produce iron products.

Electric arc furnaces generate heat by producing an electric arc between electrodes. The electrodes are generally made from carbon. The extreme heat generated at the arc makes this type of furnace suitable for ferrous metals only. Air emissions consist of metal fumes, smoke generated by impurities in the metal charge and carbon monoxide from the oxidized electrodes.

Induction furnaces generate heat by inducing eddy currents to flow within the metal from an external alternating current. Since no fuel is used and no direct contact takes place, metal contamination does not occur. These furnaces are used for high quality ferrous and non-ferrous products.

In a reverberatory furnace, a flame is maintained over the charge in a shallow refractory lined vessel. The heat radiates from the walls and roof of the vessel to the charge. Combustion products, metal fumes and smoke are generated as air contaminants.

Crucible furnaces consist of a crucible made from refractory materials and an outer shell. Combustion of a fuel takes place between the crucible and outer shell to provide the heat. These furnaces are used to melt low melting point metals. Air contaminants consist of combustion products and metal fumes.

Molten metal is shaped by introducing it into a mold. The mold essentially consists of two components; the outer mold itself and an internal core used to produce cavities within the final finished product.

Several different molding techniques are used in the industry. In general, the molding techniques can be divided into permanent and non-permanent processes. Permanent processes are those in which the mold is not destroyed in the casting process and include centrifugal casting, die casting, ceramic mold casting, permanent mold casting and direct chill casting. Non-permanent techniques are those in which the mold is destroyed during the casting process and includes sand casting, investment casting and full mold casting.

With permanent processes, the molds are made of ceramics or water cooled metals capable of withstanding the heat of the molten metal. To ensure that the molten metal flows into the mold and is easily removed, lubricants or release agents are used. These agents may be waxy substances or silicates and are usually re-applied to the mold after each cast.

The process of die casting involves the introduction of the molten metal under external forces into a water cooled die. This casting technique is applied to non-ferrous metals such as aluminum and zinc. Die casting operations are mostly automated and can produce large amounts of precise castings, quickly.

In centrifugal casting, metal is fed into a rotating mold. Centrifugal forces cause the metal to flow outward and take the shape of the mold. Hollow castings such as pipes are produced by this method.

The most common non-permanent casting technique used in the industry is sand casting. With this technique, sand is formed around a pattern. The pattern is removed and molten metal is poured into the cavity left by the pattern. Cores may also be used to produce cavities within the casting itself. After the metal solidifies, the sand is broken away and often recycled.

In order to make the sand rigid and retain the pattern shape, various agents are used as binders. Numerous trade names are used in the industry to describe various modification of the basic sand molding technique. In general, the molding processes are: "green sand" molding, dry sand molding, cold set molding and heat set molding.

Green sand molding refers to the process where water is used to moisten a sand mixture. Additives to the sand may include clay and an organic compound known as "sea" coal. The resulting mold has little strength, thus, cannot be used for castings where a high degree of precision is required.

Dry sand molding utilizes binders that harden upon drying. Such compounds as pitch, gilsonite, cereal, molasses, dextrin, gluten and some natural resins are included in this category. Also included in this category is sodium silicate which hardens with the application of carbon dioxide. Molds or cores produced by this method have high strength.

"No-bake" or cold set molding techniques use a chemical binder with a catalyst to activate the curing process. As the name implies, this process does not require heat. Catalysts can be liquids or solids which are mixed with sand prior to mold forming or gases applied to molds or cores after shaping. Cold set resins employed in the industry include furan resins with an acid catalyst such as phosphoric acid, a furan/peroxide mixture with sulfur dioxide gas used as a catalyst and polyurethane based resins with amine catalysts.

Heat set, "hot box" or "shell" molding techniques utilize thermosetting resins. Typically this process is used to manufacture cores due to the strength of the binder. Shell molding machines are very common at most sites. These machines maintain a heated metal pattern on which resin coated sand is applied. The sand quickly forms a thin rigid shell around the pattern. Two such shells can then be bonded together to form a hollow mold. Shell molds are both strong and precise. The binder used is commonly a phenolic based resin although thermosetting furan resins are also used. Urea and furfuryl alcohol can be added to phenolic based resins to enhance their properties.

Another non-permanent casting technique used is "full" mold or "evaporative" casting. In this process, a pattern made of polystyrene is placed within a sand mold. The molten metal then burns the pattern out and fills the vacant cavity. A slight variation of this process is investment casting which uses a wax pattern which is melted out prior to introduction of the metal. These casting techniques are extremely accurate.

Metal casting plants utilizing sand must have some type of sand handling system. In small foundries, sand may be delivered in bags and handled manually. In large foundries, sand handling systems can be quite elaborate. Facilities for sand handling include receiving, conveying, mixing, washing, cooling, screening and possibly thermal reclamation. All of these processes generate dust which must be controlled.

In addition to the basic casting processes, metal casting plants also have various related processes. Castings must be cleaned, excess parts removed, machined to final dimensions and inspected for flaws. Castings may be rapidly cooled using water quenches or heated in annealing ovens to alter metallic properties. Surface treatment operations such as acid cleaning or chrome coating are often employed. Dye penetrants are often used for quality control.

Any given metal casting plant may contain some or all of the processes identified above. Manufacturing facilities located at the same site as metal casting operations are considered captive under the metal casting sector. In a similar manner, casting operations associated with iron and steel works or mining operation are captive under those sectors and excluded from the metal casting sector.

V WASTEWATER

Wastewater in the metal casting sector can be classified as process wastewater, non-contact cooling water, storm run-off and sanitary wastewater.

Process wastewater by definition is water that comes in direct contact with process materials or by-products of the operation. Process wastewater will therefore be contaminated by these products. In the metal casting sector, process wastewater may be generated during cast quenches, slag quenches, cast cleaning operations, sand washing operations, surface treating and coating operations, quality control processes and from scrubbers used to control air contaminants. Scrubbers are used to control dust, smoke and fumes generated from melting and pouring operations, sand handling processes, cast cleaning and grinding operations and generally anywhere air pollution may be a problem. In general, scrubber wastewater is the largest source of process wastewater in most complex foundries.

Cooling water by definition does not directly contact the process. This water is circulated within a contained heat transfer system. Recirculating systems with cooling towers, ponds or holding tanks are often used. This necessitates the use of water conditioning chemicals to prevent fouling by slime growth, corrosion or precipitation of metals. Once through cooling water may also require conditioning if raw water quality is poor.

Cooling water is used to cool furnaces, cupolas, shell molding machines, die casting machines and dies, centrifugal molding machines, permanent molds, continuous casting dies and air compressors. This water should not be contaminated by process materials, however, it may become contaminated by heat exchanger leaks or spills to the collection system.

Scrap metal, new and used foundry sand, coke, limestone, process materials, cast products and other materials may be stored outside. Storm water run-off may therefore be a source of contamination.

Storm sewer collection systems may include floor drains within the plant allowing spills, floor washings, tank overflows and other sources of pollution to enter the storm water collection system. Connections, for the purpose of discharging industrial wastewater, may be made to down spouts from roof drains.

Metal casting plants which do not have access to municipal sanitary sewers may have on-site sanitary sewage works which discharge to a receiving stream. These biological treatment plants may also be used to treat biodegradable industrial wastes. The effluent from these plants may therefore contain industrial contaminants.

VI WASTEWATER CONTROL

Contaminants historically associated with metal casting plants include suspended solids from foundry sands, phenolics from resin binders, metals from raw materials and oil and grease from hydraulic oils, machining fluids and contaminated charge metals. If surface treating and coating operations are employed, acids and chromates will be present.

Treatment of process wastewater in the industry includes chemically aided settling of solids in clarifiers, surface ponds to float oil and grease and batch treatment of metals, acids and chromates. Metals are precipitated as hydroxides, acids neutralized and hexavalent chromium reduced to trivalent and precipitated as a hydroxide.

Treatment at any given site has not been complete. The results have gone beyond the provincial industrial discharge objectives and certificate of approval requirements for phenols, solids and some metals at various sites within the sector.

Recent initiatives in the industry have included the upgrading of suspended solids removal equipment, the treatment of high strength phenolic streams using fixed film biological processes, the installation of batch treatment systems designed with the flexibility to handle various treatment needs and general enhanced housekeeping practices to reduce water usage and eliminate unnecessary waste streams.

Smaller industries in the sector typically discharge process wastewater to the municipal sanitary sewer leaving only cooling and storm water to be discharged directly. This eliminates the need for expensive on-site treatment works.

VII THE METAL CASTING SECTOR INDUSTRIES

The metal casting sector in Ontario contains thirteen plants which have been identified as direct dischargers. These thirteen plants vary in size, use different processes and produce different products.

The following provides a brief description of the industries in this sector. Three of the plants discharge process wastewater. The remaining ten discharge combined, cooling or storm water.

A. Acustar Canada Inc - Etobicoke

Employees - 450

Products - automotive parts

Metals - aluminum

Melting Techniques - reverberatory furnaces

Molding Methods - die casting and permanent molding

Raw Water - municipal

Wastewater - cooling, storm

Treatment - none

Final Effluent - 1200 m^3/d (estimate)

Discharge Point - creek to Lake Ontario

B. The Bowmanville Foundry Co. Limited - Bowmanville

Employees - 62

Products - agricultural and construction equipment

Metals - malleable iron

Melting Techniques - induction furnaces

Molding Methods - sand

Raw Water - municipal

Wastewater - cooling water from induction furnaces
- storm water

Treatment - none

Final Effluent - 140 m^3/d

Discharge Point - Bowmanville Creek to Lake Ontario

C. Canada Alloy Castings, Ltd. - Kitchener

Employees - 110

Products - castings of industrial equipment

Metals - stainless steel

Melting Techniques - induction furnaces

Molding Methods - silica sand - cold set sand

Raw Water - municipal

Wastewater - cooling water from heat exchangers and heat treat quench tank

Treatment - for pH and algae

Final Effluent - 170 m^3/d

Discharge Point - quench tanks to sanitary sewer; heat exchangers to storm sewer to Schneider creek

D. Canada Pipe Company Limited - Hamilton

Employees - 270

Products - pipe

Metals - ductile iron

Melting Techniques - cupola, induction furnaces

Molding Methods - continuous, centrifugal, shell sand

Raw Water - municipal

Wastewater - cupola scrubber tank overflow, slag quench tank overflow, cement lining process wastewater
- cooling, storm

Treatment - solids removal for cement wastewater and scrubber wastewater

Final Effluent - 75 m^3/d (estimate)

Discharge Point - storm ditch to Hamilton Harbour.

E. Crowe Foundry Limited - Cambridge

Employees - 200

Products - castings for automobile parts, diesel engine parts, pumps, agricultural equipment and electric motor parts

Metals - grey and ductile iron

Melting Techniques - induction furnaces

Molding Methods - jolt squeezer, no bake green sand

Raw Water - municipal

Wastewater - cooling water from air compressors, induction furnaces, blowdown from wet dust collection; storm water; SO2 scrubber wastewater

Treatment - solids removal from wet dust scrubber wastewater

Final Effluent - 50-100 m^3/d

Discharge Point - drainage ditch to Speed River

F. Indusmin, Division of Falconbridge Limited - Orillia

Employees - 240

Products - industrial equipment parts

Metals - steel

Melting Techniques - electric arc and induction furnaces

Molding Methods - centrifugal, shell sand, cold set sand, green sand

Raw Water - municipal

Wastewater - quench tank, mold wash tank overflow; cooling and storm water

Treatment - cooling pond

Final Effluent - 130 m^3/d (estimate)

Discharge Point - cooling pond overflow to storm ditch to Lake Simcoe.

G. Ford Motor Company of Canada, Limited - Windsor

Employees - 1000

Products - automotive parts

Metals - nodular and grey iron

Melting Techniques - cupolas

Molding Methods - green sand, shell sand

Raw Water - Detroit River

Wastewater
- dust collectors, slag quench
- cooling, storm

Treatment - suspended solids removal by clarification, oil lagoon

Final Effluent - 90,000 m^3/d

Discharge Point - Detroit River

H. Franklin Electric of Canada, Ltd. - Strathroy

Employees - 200

Products - electrical equipment

Metals - aluminum

Melting Techniques - reverberatory furnaces

Molding Methods - die casting

Raw Water - on-site wells

Wastewater
- cooling water from air compressors, die casting machines and hydraulic systems on milling machines
- quench tank and phosphate rinse tank overflows
- storm water

Treatment - aerated cooling pond

Final Effluent - unknown

Discharge Point - cooling pond overflow to creek to Sydenham River

I. General Motors of Canada Limited - St. Catharines

Employees - 2500

Products - automotive parts

Metals - nodular and grey iron

Melting Techniques - cupolas, induction furnaces

Molding Methods - green sand, heat set sand, cold set sand, shell sand

Raw Water - Welland Canal

Wastewater - dust collectors; cooling and storm

Treatment - suspended solids removal by clarification, oil lagoon, biological oxidation for phenols

Final Effluent - 130,000 m^3/d

Discharge Point - Welland Canal.

J. Haley Industries Limited - Haley Station

Employees - 413

Products - aircraft parts

Metals - aluminum, magnesium

Melting Techniques - crucible furnaces

Molding Methods - heat set sand, cold set sand

Raw Water - neighboring mine

Wastewater - dust collectors, acid and chromate baths, fluorescent dye penetrant, SO^2 scrubber; cooling and storm

Treatment - settling, acid neutralization, chromate reduction, biological oxidation for penetrating oils, SO^2 precipitation

Final Effluent - 600 m^3/d

Discharge Points - two process sewers to McLaren Creek.

K. Magalloy Limited - Stratford

Employees - 38

Products - pumps and valves

Metals - steel

Melting Techniques - induction furnaces

Molding Methods - sand

Raw Water - municipal

Wastewater - cooling for induction furnaces and equipment for thermal reclamation of sand

Treatment - none

Final Effluent - unknown

Discharge Point - creek

L. Richmond Die Casting Ltd. - Cornwall

Employees - 125

Products - custom products, mainly automotive parts

Metals - aluminum

Melting Techniques - reverberatory furnaces

Molding Methods - die casting

Raw Water - municipal

Wastewater - cooling for die casting machines and air compressors

Treatment - none

Final Effluent - 1500 m^3/d (estimate)

Discharge Point - Frazer Creek to St. Lawrence River

M. Western Foundry Company Limited - Wingham

Employees - 300

Products - automotive parts

Metals - grey iron

Melting Techniques - induction furnaces

Molding Methods - sand and heat set sand

Raw Water - municipal

Wastewater - cooling for induction furnaces, air compressors and shell core machine

Treatment - none

Final Effluent - 2000 m^3/d (estimate)

Discharge Point - Maitland River

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GLOSSARY OF TERMS

AFS	The Ontario Chapter of the American Foundrymans Society
ATG	Analytical Test Groups
BATEA	Best Available Technology Economically Achievable
CAS	Chemical Abstract Service
CDCA	Canadian Die Casters Association
CFA	Canadian Foundry Association
EMPPL	Effluent Monitoring Priority Pollutants List
4AAP	4 Amino Antipyrine Method
LTATEC	Long Term Average Treatment Effluent Concentrations
MAC	MISA Advisory Committee
MDL	Method Detection Limits
PSES	Pretreatment Standards for Existing Sources
PSNS	Pretreatment Standards for New Sources
SIC	Standard Industrial Classifications
TTO	Total Toxic Organics
UGLCCS	Upper Great Lakes Connecting Channel Study

PART II

THE TECHNICAL RATIONALE FOR THE EFFLUENT MONITORING REGULATION - METAL CASTING SECTOR

PART II - THE TECHNICAL RATIONALE FOR THE EFFLUENT MONITORING REGULATION - METAL CASTING SECTOR

I INTRODUCTION

The Effluent Monitoring Regulation for the Metal Casting Sector is designed to provide an accurate and credible account of priority and conventional pollutants being discharged from the Metal Casting Sector. This information is required in order to develop effluent limits. In developing the regulation, many approaches and options were considered for use. This section provides the technical rationale for the adopted approaches.

The Effluent Monitoring Regulation was developed by the Ministry of the Environment (MOE) in consultation with representatives from the metal casting industry, Environment Canada and the Ministry of Industry, Trade and Technology. Under the Effluent Monitoring Regulation, effluent data will be collected for the development of a subsequent effluent limits regulation.

The Effluent Monitoring Regulation was developed using existing monitoring data and data from pre-regulation monitoring studies undertaken by selected industries and the Ministry of the Environment. Due to economic restraints, all plants within the sector were not monitored, however, the pre-regulation monitoring program included all major direct dischargers and a good cross-section of companies using different processes and materials. The data is therefore representative of the industry as a whole.

II THE NEED FOR REGULATION

The goal of the MISA program is to reduce and ultimately eliminate the discharge of toxic chemicals into surface waters. This will be achieved in various stages. Initially, effluent limits will be set for nine industrial sectors and the municipal sector based on discharge levels obtainable by the use of Best Available Technology Economically Achievable (BATEA).

Metal casting plants or foundries melt the metal produced by primary producers and cast the metal into specific products. The metal casting sector produces ferrous, magnesium, aluminum, brass and copper products.

Foundries may discharge process effluent, cooling water and/or storm water. Process effluent may contain metals, particulates, organics and oil and grease. With the large effluent volumes that are generated during metal casting processes, the loadings of these contaminants to natural watercourses can cause negative environmental impacts.

Existing effluent monitoring data in this sector was reviewed. It was concluded that this data, while being useful for monitoring regulation development, was insufficient for the development of a limit setting regulation. Existing monitoring efforts have been geared at estimating the average monthly loadings of conventional parameters from major plants within the sector. Other data consists of periodic spot checks performed by the Provincial and Municipal governments for a few conventional parameters.

Some priority pollutant data exists from Environment Canada's efforts with the Upper Great Lakes Connecting Channels Study (UGLCCS) and U.S. EPA studies.

A comprehensive monitoring program is therefore required to supplement existing monitoring data for conventional parameters and to determine the levels of priority pollutants being discharged by the Ontario metal casting industry. (Data sources used are listed in Appendix A.)

III THE U.S. EPA'S APPROACH

The U.S. EPA (17) studied the metal casting industry during the 1970's and 1980's and subsequently promulgated effluent regulations for the Metal Molding and Casting Point Source Category in October 1985. The pre-regulation development studies included process and raw material reviews and sampling for 30 conventional and 129 priority pollutants.

The U.S. EPA metal molding and casting sector was divided into five industrial categories and 31 process subcategories for study purposes. The five industrial categories were based on the following metal groups: aluminum, copper, ferrous metals, magnesium and zinc. The regulation, however, specifies limits for only four of the industrial categories and 28 of the process subcategories. The magnesium industry was excluded for economic reasons.

The industrial categories and process subcategories are as follows:

Aluminum	Casting Cleaning Operations Casting Quench Operations Die Casting Operations Dust Collection Scrubber Operations Grinding Scrubber Operations Investment Casting Melting Furnace Scrubber Operations Mold Cooling Operations

Copper	Casting Quench Operations
	Direct Chill Casting Operations
	Dust Collection Scrubber Operations
	Grinding Scrubber Operations
	Investment Casting
	Melting Furnace Scrubber Operations
	Mold Cooling Operations
Ferrous	Casting Cleaning Operations
	Casting Quench
	Dust Collection Scrubber Operations
	Grinding Scrubber Operations
	Investment Casting
	Melting Furnace Scrubber Operations
	Mold Cooling Operations
	Slag Quench Operations
	Wet Sand Reclamation Operations
Zinc	Casting Quench Operations
	Die Casting Operations
	Melting Furnace Scrubber Operations
	Mold Cooling Operations

The U.S. EPA Regulation specifies Best Available Technology (BAT) effluent limits for pH, total suspended solids, oil and grease, total phenolics (4AAP), copper, lead and zinc. BAT limits for the four categories are formulated on maximum recycling, oil skimming for oil and grease reduction, chemical oxidation using potassium permanganate for phenol reduction, lime addition and settling for metals and solids control and filtration for metals and solids polishing.

It is important to note that toxic organics are not directly regulated. The U.S. EPA concludes that toxic organics can be controlled by limiting oil and grease levels, since, toxic organics found in this sector have a higher affinity for oil and grease than water(17).

As an alternate to using oil and grease as a surrogate, the U.S. EPA specifies limits for total toxic organics (TTO) as pretreatment standards for new and existing sources (PSNS and PSES). These limits are based on the "long-term average treatment effectiveness concentration" (LTATEC) which represents the average concentration achievable by implementing BAT.

The TTO limits for each subcategory were determined by,

- adding the LTATEC for each of the pollutants detected above the treatable limit in raw wastewater from that subcategory, and then,

- applying statistically determined variability factors to arrive at the maximum one day limit and maximum monthly average.

A list of the LTATECs for all compounds that make up TTO in the various subcategories is presented in Table 1, Appendix B.

A complete summary of the U.S. EPA program is presented in the EPA Development Document for Effluent Limitations, Guidelines and Standards for the Metal Molding and Casting (Foundries) Point Source Category (17). This document provides extensive background information on the metal casting industry and includes,

- a summary of the processes used in the sector,
- a summary of the compounds detected in metal casting process effluent and the concentrations at which these compounds were detected, and
- recommendations for which parameters require effluent limits.

The information from this document was used,

- as background process information,
- to identify which compounds may be present in metal casting effluent.

IV MONITORING REGULATORY APPROACH

The MOE does not follow the subcategorization approach adopted by the U.S. EPA.

In developing the MISA monitoring regulation for the sector, a site-specific approach was adopted. This approach was selected since it could best account for the water usage practices and diversity in size of plants within the sector.

In developing the site-specific monitoring requirements for each direct discharger, the following items were considered:

- The nature of the processes contributing to the wastewater stream;
- The expected characteristics of the wastewater stream; and
- The potential environmental impact caused by the wastewater stream, and its magnitude.

The metal casting sector regulation contains thirteen site-specific monitoring schedules, one for each plant listed in Part I of this development document.

V EFFLUENT STREAM TYPES

A review of all metal casting plants within the sector identified the following stream types:

- Process;
- Cooling water;
- Cooling water with a potential for contamination; some cooling water effluent streams may occasionally receive process effluent water which spills into the cooling water collection system via floor drains or through the discharge of quench tanks. These streams are considered as cooling water effluent streams for the purpose of applying the General Regulation. However, for the purpose of developing the site-specific monitoring requirements, these streams are given special consideration and have additional monitoring requirements. Designation of these streams as process or combined effluent streams is not considered appropriate since these streams only receive process effluent on occasional basis.

  Under the limits regulation, these streams will be dealt with,

  - by applying best management practices to eliminate the sources of process effluent, and/or
  - by applying effluent limits, generated by monitoring other similar process effluents, to the process component of these streams.
- Combined effluent streams contain at least one well defined process effluent stream plus cooling water and/or storm water.
- Storm water run-off from contaminated areas;

VI FLOW MEASUREMENT

The General Regulation outlines the flow measurement requirements for the various types of metal casting effluent streams. These requirements are as follows:

Process effluent streams are required to be continuously measured by devices with an accuracy of plus or minus 15% of the actual flow, if existing equipment is used. If new equipment is to be installed, an accuracy of plus or minus 5% of the actual flow and plus or minus 2% of full scale flow for the primary and the secondary flow measuring devices respectively is required.

Combined effluent streams are required to be continuously measured by flow measuring devices with an accuracy of plus or minus 20% of the actual flow.

Storm water, cooling water and **cooling water effluent streams with a potential for contamination** are required to be measured or estimated within plus or minus 20% of the actual flow at the time of sampling.

VII PRE-REGULATION MONITORING

Pre-regulation monitoring studies were undertaken by selected industries in the sector to provide a basis from which the effluent monitoring regulation could be developed. The plants which voluntarily took part in the pre-regulation monitoring program were,

- Acustar Canada, Etobicoke,
- Ford Motor Company, Windsor,
- General Motors, St. Catharines, and
- Haley Industries, Haley Station

Acustar monitored their cooling water effluent stream, Ford and General Motors monitored both their process and combined effluent streams and Haley Industries monitored all their process effluent streams.

The monitoring program for each effluent sampling point consisted of the collection of three 24 hour composite samples taken on separate operating days. The samples were analyzed for conventional parameters and priority pollutants. Table 3, Appendix B summarizes the priority pollutants that were analyzed for each sample. Table 4, Appendix B summarizes the frequency of detection of these compounds. Table 5, Appendix B summarizes the number of organic compounds detected in each analytical test group for each effluent stream. Table 6, Appendix B lists the organic compounds detected above their LTATECs.

The pre-regulation monitoring program played an important role in the development of the monitoring strategy. The program's results were used as follows:

1. To evaluate which parameters were of concern.

2. To identify compounds not currently listed on the Effluent Monitoring Priority Pollutant List (EMPPL). These compounds are now undergoing review to determine whether or not they meet the criteria for addition to EMPPL.

3. To compare to existing monitoring data for conventional parameters, in order to evaluate the representativeness of the existing data. This comparison confirmed the persistent problem with high levels of phenols and suspended solids in foundry process effluent.

VIII MONITORING STRATEGY - GOALS AND GENERAL RULES

The main goals of the MISA metal casting sector monitoring program are to,

- accurately quantify the concentrations and mass loadings of those contaminants associated with metal casting effluent,

- establish a data base on effluent quality for the development of effluent limits,

- evaluate the toxicity of metal casting effluent.

In developing the monitoring strategy for the metal casting sector, some general rules were followed. These rules were developed in order to ensure that the goals of the monitoring program were achieved. The general rules were as follows:

1. The monitoring principles specified in the General Regulation will be applied where possible.

2. Existing monitoring data, including pre-regulation monitoring data, will be used where possible to justify parameter selection and monitoring frequency. In the absence of supporting data, best professional judgement will be used.

3. An approach consistent with other Sectoral Effluent Monitoring Regulations will be used, if applicable.

4. All metal casting effluent streams will be monitored. The monitoring requirements for each stream will be a function of the origin and the characteristics of the stream, the potential environmental impact of the stream (if any) and its magnitude.

IX FREQUENCY ASSIGNMENT RATIONALE

The monitoring frequencies selected for use in the metal casting sector include daily, thrice weekly, weekly, monthly and quarterly monitoring. The selection of these frequencies was statistically based. A summary of the statistical rationale is provided below.

The number of samples is a function of the specified relative error, desirable significance level and variability of the contaminant. Analytical results obtained from these samples will vary for many reasons including: process fluctuations, sampling errors and analytical errors. To quantify this variability, the coefficient of variation, defined as the standard deviation divided by the mean, was used. The number of samples required to calculate the monthly mean with a relative error of 25% at the 95% significance level was investigated by Ministry staff (14). Parameters with coefficients of variation of 0.7, 0.5 and 0.25 require 30, 15 and 4 samples per month respectively, to determine the monthly mean within the specified limits. Based on these required number of samples, **daily, thrice weekly and weekly** monitoring frequencies were selected for use. Daily, thrice weekly and weekly monitoring will be used to accurately quantify loadings.

When several values of the calculated coefficient of variation are available, the highest value is considered appropriate since it represents the worst case. A summary of the calculated coefficient of variations for several conventional parameters is presented in Table 7, Appendix B. This data is based on Environment Canada's efforts with the UGLCCS at Ford's Windsor Casting Plant (3). The coefficient of variation for each parameter, while being based on the monitoring results from one plant, was assumed to apply to other plants in the sector.

In order to estimate yearly loadings for priority pollutants and conventional parameters known to be present but at low concentrations, **monthly** monitoring is required. Annual loadings will be considered in developing monitoring requirements for the subsequent limits regulation. The results will also be used for inter-sector comparisons of loadings.

When compounds are not present or measurable all the time, statistical methods must be used to ensure, with a high degree of confidence, that a compound will be detected if in fact it is present in measurable amounts. By applying the binomial probability distribution in which the probability of detecting a compound in any given sample is p and the probability of failing to detect the compound is q, the probability that at least one sample will show the presence of the compound in n samples is

$$p(\text{at least one detection}) = 1 - q^n \quad .$$

Table 2, Appendix B shows the probability of detecting at least once, the compound in 2, 4, 6, 8, 10 and 12 samples for various values of p and q. For a given parameter that is present 50% of the time or greater in an effluent, the probability of finding the contaminant is 98.4% with six samples and 93.7 % with four samples. Based on this the regulation specifies **quarterly** sampling for determining presence or absence of the contaminants. This frequency, in conjunction with pre-regulation monitoring, ensures that if a compound is present 50% of the time in metal casting effluent, it will be identified with a probability of greater than 99%.

A summary of the number of pre-regulation dioxin analyses is given in Table 3, and the frequency of detection of organic compounds in the effluent identified during the pre-regulation monitoring program is presented in Table 4 and Table 5, Appendix B. A list of the organic compounds detected above the LTATEC is presented in Table 6, Appendix B.

X GENERAL PARAMETERS/FREQUENCY ASSIGNMENT RULES

In selecting a suitable monitoring frequency for each group of contaminants a set of selection rules were developed for each monitoring frequency. Each parameter was evaluated with respect to its origin, variability, concentration and its presence/absence in the effluent stream. Required information needs and existing monitoring practices were also examined. The selection rules were applied to each parameter to determine a suitable monitoring frequency.

1. For **process effluent streams,**

   (a) Frequent routine monitoring (e.g. **daily, thrice weekly**) will be used to establish limits or to monitor the process.

   (b) **Monthly** monitoring is required for parameters that are known to be present and to establish the effluent limits for them.

(c) **Quarterly** monitoring is required to determine presence/absence of other toxic compounds in order to add these compounds to the MISA list to establish limits.

For the process effluent streams, the regulation typically specifies monitoring for four parameters daily, as many as six parameters thrice weekly, as many as three parameters weekly and as many as fourteen parameters or groups of contaminants (108 compounds) monthly. Toxicity testing is required on a monthly basis. Characterization and open characterization are required quarterly.

Characterization, open characterization and toxicity testing are discussed in separate sections following the discussion on routine chemical monitoring.

2. **Cooling water effluent** is required to be monitored monthly for as many as ten parameters.

3. **Storm water effluent** is required to be monitored monthly for as many as fifteen parameters. Some storm water and cooling water effluent streams will be monitored monthly or quarterly for polychlorinated biphenyls.

4. **Combined effluent** is required to be monitored for at least ten parameters at a daily or thrice weekly monitoring frequency, and for six parameters at a weekly monitoring frequency. Monthly monitoring is required for up to fourteen parameters, or groups of parameters.

5. **Cooling water effluent with a potential for contamination** is required to be monitored for at least ten parameters (or group of parameters) on a monthly basis. Quarterly characterization and toxicity tests are also required on these streams.

The selection rules and parameters selected for each monitoring frequency are discussed below.

XI SPECIFIC PARAMETERS/FREQUENCY ASSIGNMENT RULES

There are four basic frequencies of monitoring required by the Metal Casting Sector Effluent Monitoring Regulation: daily, thrice weekly, weekly and monthly.

i) Daily

The parameters chosen for daily monitoring will be used to:

- Calculate average daily concentrations and loadings,
- Identify average and maximum effluent limits for any one day,
- Establish a comparison among different sites,

- Identify upset and spill conditions both in magnitude and frequency,
- Establish limits to control conventional pollutants.

Parameters which are monitored daily as an operating control for the treatment process will provide an accurate data base from which BATEA limits may be derived.

ii) Three Times Per Week

The parameters chosen for thrice weekly monitoring will be used to:

- Calculate monthly loadings and concentrations,
- Provide a record of variability in process loadings and treatment plant upsets and spills,
- Establish limits for priority pollutants and conventional parameters in effluent streams,
- Establish a basis for inter-sector comparisons of loadings to the receiving water.
- Aid in the identification of well operated wastewater treatment plants which could be considered as benchmarks for the designation of BATEA,
- Establish the performance of wastewater treatment plants in comparison to EPA reference limits,

iii) Weekly

Weekly monitoring data will be used to:

- Evaluate the need for control of traditional contaminants (e.g. total phosphorus),
- Establish limits to control conventional and priority pollutants.

iv) Monthly

Monthly monitoring data will be used to:

- Identify contaminants of concern which may require more frequent monitoring,
- Provide information on the presence of toxic contaminants to be considered with the monthly toxicity testing results,
- Show whether particular toxic contaminants that are monitored more frequently are representative of corresponding groups of toxic contaminants,
- Establish limits to control priority pollutants.

XII MONITORING DATE APPLICATIONS

This section deals with the allocation of the parameters to effluent streams and the assignment of the parameters to specific monitoring frequencies.

A Process Effluent Streams

Process effluent streams contain waters which are used directly in the process. As a result, process effluent streams are usually contaminated with the materials used during the process or with the by-products of the casting operations. Consequently, metal casting plants will monitor process effluent streams on a daily, thrice weekly, weekly and monthly basis.

Daily monitoring will be for hydrogen ion (pH), specific conductance, total suspended solids and total phenolics (4AAP). The rationale for including these parameters is as follows:

Hydrogen Ion (pH)	- indicator of process upsets and variability;
	- control parameter for soluble metals;
Specific Conductance	- indicator of process upsets and variability;
	- indicator of dissolved inorganic salts which may impact on aquatic life.
Total Suspended Solids	- present in high concentrations in foundry raw effluents
	- measure of suspended solids treatment plant performance;

Phenolics (4AAP)	-	present in high concentrations in foundry raw wastewater
	-	imparts taste and odour to drinking water

These daily monitoring parameters have been regulated by the U.S. EPA (17) and are usually included in Certificates of Approval and Control Orders issued by the Ontario Ministry of the Environment (5,6,7).

Metal casting plants will monitor process effluent streams on a **thrice weekly** basis for chemical oxygen demand, ammonia plus ammonium, total metals, hexavalent chromium, oil and grease, iron, manganese and fluorides. Ammonia plus ammonium will be monitored at this frequency in site-specific cases where pre-regulation monitoring data suggests that current Provincial Water Quality Objectives (13) may be exceeded for free ammonia. Fluorides will be monitored at this frequency in site-specific cases where pre-regulation monitoring data and process information suggests their presence. The rationale for including these parameters is as follows:

Chemical Oxygen Demand	-	a measure of total oxygen demanding material including organic material, reduced metals, refractory (non-biodegradable) compounds and other oxidizable compounds. This parameter is an indicator of the oxygen depletion impact of the process effluent stream on the receiving stream. Biochemical oxygen demand (BOD) was initially considered but it was eliminated because of analytical problems, i.e. laboratories carrying out this test must obtain an acclimated bacterial seed for each industrial effluent;
	-	due to the presence of phenolic compounds and other oxygen demanding materials, foundry effluent may have significant impact on the oxygen levels in the receiving waters. As a result of this, COD will be assessed for establishing the limits.
Ammonia + Ammonium	-	may be present at elevated levels in metal casting effluents due to the thermal decomposition of resins containing nitrogen or from ammonium containing compounds used in the plant;

	-	un-ionized ammonia is toxic to aquatic life at very low concentrations. The fraction of total ammonium that exists as un-ionized ammonia is a function of pH and temperature;
	-	pre-regulation monitoring data showed for some effluents ammonia plus ammonium concentrations at levels which may result in an un-ionized ammonia concentration in the receiving stream in excess of the Provincial Water Quality Objective(13). These effluents are required to be monitored thrice weekly. Effluents where ammonia plus ammonium was not detected at high levels and/or which are not expected to contain high levels, are required to be monitored monthly since ammonia plus ammonium will not be considered for control limits on these streams;
Total Metals	-	always present in metal casting process and combined effluent streams;
Hexavalent Chromium	-	compounds containing hexavalent chromium are used for the surface treatment of some metals and thus, hexavalent chromium may be present in high concentrations in some effluents. Total chromium is measured thrice weekly as part of total metals. Total chromium analysis measures both trivalent chromium which is not considered toxic and hexavalent chromium which is. If total chromium exceeds one milligram per litre, hexavalent chromium may be present at harmful levels and should be monitored separately.
Oil and Grease	-	present in the effluent in measurable amounts originating from hydraulic oils, cutting fluids and lubricants.
	-	indicator of toxic organics being discharged since toxic organic compounds present in metal casting process effluent have a higher affinity for oil and grease than water(17).

Iron and Magnesium	-	added to the sector list since they are base metals used in the industry and may be present in high concentrations. While not considered toxic, these parameters can be used to monitor process metal losses to the environment.
Fluorides	-	fluorides may be present in metal casting effluents because hydrofluoric acid baths are used to clean and etch the surface of metal castings; fluoride salts are used as fluxes in melting processes; the decomposition of organic compounds containing fluorine, which are used as mold release agents, may result in the generation of fluoride containing compounds;
	-	pre-regulation monitoring data revealed fluoride levels in some effluents orders of magnitude greater than the current Ontario Drinking Water Objective(8) and Water Quality Criteria for Livestock Watering(13). These effluents are required to be monitored thrice weekly to evaluate this parameter as a candidate for establishing limits. Effluents where fluorides were not detected at high levels or which are not suspected to contain high levels of fluorides, are required to be monitored monthly.

The parameters selected for **weekly** monitoring are nitrate plus nitrite, dissolved organic carbon, total phosphorus, phenanthrene and naphthalene. The rational for including these parameters is provided below.

Nitrate + Nitrite	-	nitrate may be present in elevated concentrations in the effluent when nitric acid bath wastes are discharged. Nitrate may be reduced to nitrite which is a parameter controlled in public water supplies. For industries not using nitric acid baths, nitrate plus nitrite levels are generally below the Ontario Drinking Water Objective of 10 mg/l(8). For these streams monthly monitoring is sufficient;

	-	levels slightly above the Ontario Drinking Water Objective were observed during pre-regulation monitoring at one site utilizing nitric acid baths.
Dissolved Organic Carbon	-	a measure of the total amount of soluble organic carbon. Organic materials used in this industry contain toxic compounds, thus, changes in the DOC level can be used to predict gross changes to the level of toxic organics being discharged;
	-	lower detection limit than total organic carbon makes this test more attractive. Also, solids in the wastewater are expected to be mostly inorganic therefore, DOC levels should be similar to TOC levels;
	-	monitoring at this frequency is required to study organic loading variability.
Total Phosphorus	-	present in metal casting effluent;
	-	estimates of monthly loadings are required to meet the commitments of the Canada-United States Great Lakes Water Quality Agreement (4). Weekly grab samples are currently reported for this purpose.
Base Neutral Extractables	-	present in materials used on-site;
	-	PAH's may be generated by the destructive distillation of sea coal;
	-	wide variety of compounds detected at concentrations above the method detection limits during pre-regulation monitoring. Phenanthrene and Bis(2-ethylhexyl) phthalate detected in average concentrations above their LTATEC. Bis(2-ethylhexyl) phthalate concentration attributed to sample artifact;
	-	naphthalenes consistently present at concentrations below the LTATECs;

- phenanthrene and naphthalene are indicators of other compounds in this test group. Weekly monitoring for these two compounds is required to study variability and to determine yearly loadings. Monitoring of the entire ATG 19 is required monthly.

The parameters selected for **monthly** sampling include total cyanide, ammonia and ammonium, nitrate plus nitrite, mercury, total alkyl lead, sulfides, halogenated volatiles, non-halogenated volatiles, water soluble volatiles, base neutral extractables (see weekly), acid extractables, fatty and resin acids, PCBs and fluorides. Total alkyl lead will be monitored only if total lead concentrations exceed one milligram per litre. Entire groups of organic chemicals will be analyzed since the cost for individual analysis is identical to the cost for group analysis.

The rationale for monitoring these parameters on a monthly basis is as follows:

Total Cyanide - detected during pre-regulation monitoring;

- free cyanide is toxic to fish at low concentrations. The Provincial Water Quality Objective for free cyanide is 5 ug/l. Total cyanide can be a delayed source of free cyanide. Monthly monitoring is required to interpret toxicity testing data.

Mercury - may be present as a contaminant in charge metals.

- detected during pre-regulation monitoring at concentrations above the method detection limit but below the treatable level of 36 ug/l (17);

Total Alkyl Lead - alkyl leads were detected during pre-regulation monitoring studies when total lead concentrations exceeded one milligram per litre.

- if total lead exceeds one milligram per litre, alkyl leads may exist at harmful concentrations and should be monitored separately;

Sulphides	- present in slag quench wastewater;
	- detected during pre-regulation monitoring.
Halogenated Volatiles	- used as degreasing and cleaning solutions and in mold release agents;
	- during pre-regulation monitoring, nine compounds were detected at concentrations above their method detection limits. No compounds were detected above their LTATEC (See Table 6, Appendix B);
Non-Halogenated Volatiles	- used as solvents and cleaners. May be formed by decomposition of polymers used in the industry;
	- seven compounds detected at concentrations above the method detection limits during pre-regulation monitoring. No compounds detected in average concentrations above their LTATEC;
Water Soluble Volatiles	- may be generated by the thermal decomposition of some organic binders (17);
	- acrylonitrile detected at concentrations above its method detection limit but below U.S. EPA treatable levels (17) during pre-regulation monitoring.
Acid Extractables	- some phenolic compounds are present in high concentrations (greater than 100X the current Provincial Water Quality Objective for total phenolics), however, monthly monitoring is only required since total phenolics are measured more frequently;
	- two compounds detected above the LTATEC. These were low molecular weight non-chlorinated phenolics which will be monitored using the total phenolics (4AAP) test. Control of total phenolics will ensure control of these species.

Fatty and Resin Acids	-	present in some cutting and machining oils;
	-	oleic acid detected during MOE pre-regulation monitoring.
PCBs	-	historically used in hydraulic oils and electrical transformers;
	-	detected during pre-regulation monitoring at concentrations above the method detection limit but approximately equal to the treatable limit (17).

B Cooling Water Effluent Streams

Cooling water by definition does not come in direct contact with process materials and thus, should not be contaminated by any materials other than those added for water conditioning. Chemicals that are added to treat cooling water should not fluctuate significantly since they are added at a controlled rate. Industries are required to record and report the amount of chemicals added. These chemicals, if listed on EMPPL, will be monitored monthly.

Cooling water is used to cool furnaces, air compressors and casting machines. It is not used to cool process effluent streams, however, process effluents may contaminate cooling water through spills. Cracked or worn out heat exchanger surfaces, spills to the cooling water collection system, surface erosion of dies and pipes and generally poor housekeeping practices may result in contaminants entering a cooling water. These conditions are considered upset conditions and should be rectified when identified. The monitoring program is aimed at identifying these upset conditions. The parameters chosen for monitoring cooling water are parameters that will bring attention to equipment problems and that will identify sources of contamination that may have been overlooked. Spills of process chemicals to the cooling water system are required to be reported under the Environmental Protection Act.

Direct dischargers are required to monitor cooling water monthly for hydrogen ion (pH), dissolved organic carbon, total suspended solids, total metals, hexavalent chromium, total alkyl lead, phenolics (if phenolic compounds are used on site), oil and grease, iron, magnesium and fluorides. PCBs are required to be monitored quarterly if stored or used on-site.

It is important to note, that, the Ministry of the Environment will audit some effluent streams twice, and others once, during the life of the regulation. Audits will include analyses for PCBs.

C Cooling Water Effluent Streams with a Potential for Contamination

Cooling water effluent streams with a potential for contamination may contain a small amount of process effluent. Accordingly, companies with this type of effluent are required to perform quarterly characterization analyses, in addition to the monitoring requirements for cooling water effluent. Reference should be made to Schedules A to M for these requirements.

D Storm Water Effluent Streams

If raw materials, products or wastes are stored outside, storm water run-off may be contaminated. To identify whether there is contamination and the severity of any such contamination, monitoring is required.

Storm water should be monitored during a storm event or thaw at least once a month. In months when no suitable storm event or thaw occurs, a second sample should be taken the following month.

Industries are required to monitor storm water monthly for hydrogen ion (pH), dissolved organic carbon, total suspended solids, total metals and oil and grease. Monitoring of fluorides and phenolics is required monthly when materials containing these compounds are stored on-site. PCBs are required to be monitored quarterly if stored or used on-site.

If the probability of contamination of the storm water with the process effluent stream for the particular site is high, the company may be asked to do monthly monitoring for a few additional parameters, such as: chemical oxygen demand, total cyanide, nitrogen, total phosphorus, hexavalent chromium, total alkyl lead, sulphide iron and magnesium.

E Combined Effluent Streams

Combined effluent streams will be monitored daily, weekly, thrice weekly and monthly and will be analyzed for various parameters.

Industries are required to monitor combined effluent daily for pH, specific conductance, total suspended solids and phenolics; weekly for COD, DOC, total phosphorus, total metals, hexavalent chromium and oil and grease; thrice weekly for iron and magnesium and monthly for total cyanide, ammonia and ammonium, nitrate and nitrite, mercury, total alkyl lead, sulphide, halogenated, non-halogenated and water soluble volatiles, base neutral and acid extractables and fatty and resin acids. Monitoring of fluorides and phenolics is required monthly when materials containing these compounds are stored on-site. PCBs are required to be monitored quarterly if stored or used on-site.

XIII CHARACTERIZATION AND OPEN CHARACTERIZATION

Characterization and open characterization analyses are required to determine the presence of toxic contaminants listed on EMPPL but not detected to date in metal casting effluent, and to identify toxic contaminants not listed on EMPPL.

Characterization and open characterization requirements analyses will be conducted on:

- process effluent streams,
- combined effluent streams, and
- cooling water effluent streams with a potential for contamination.

Direct dischargers with process and combined effluent streams are required to perform characterizations (Schedule AA) and open characterizations once in each quarter on all process effluent streams. Characterization for this group includes monitoring for the entire EMPPL with the exception of analytical test groups 21 (herbicides) and 22 (pesticides). Herbicides and pesticides are not included, because they are not generated or used in the metal casting sector. Open characterization includes an open organic scan (volatiles and extractables) and an elemental scan. Analyses for all EMPPL compounds will be at the method detection limits prescribed in the General Regulation.

Chlorinated dibenzo-p-dioxins and dibenzofurans (ATG 24) were not detected in any known research studies in the sector. Pre-regulation monitoring for chlorinated dibenzo-p-dioxins and dibenzofurans was performed on effluent from all major process effluents in the sector and on one separate cooling water effluent (see Table 3, Appendix B). No chlorinated dibenzo-p-dioxins or dibenzofurans were detected. However, the environmental importance of this group warrants that its absence be confirmed during the monitoring period. Three companies are required to monitor their process and combined effluent streams for ATG 24 on a semi-annual basis.

Direct dischargers having cooling water effluent streams with a potential for contamination and selected dischargers having combined effluent streams with the lower flow, are required to conduct characterization analyses using the entire EMPPL except ATGs 21 to 24 (Schedule BB). Compounds in these ATGs were not detected during pre-regulation monitoring studies. Direct dischargers with cooling water effluent streams with a potential for contamination are not required to perform open characterization.

Characterization and open characterization is required after each significant process change which may affect the chemical nature of the final effluent.

XIV TOXICITY TESTING

Toxicity testing using both the 96-hour Rainbow Trout (Salmo gairdneri) Toxicity Test and the 48-hour LC50 Daphnia magna Acute Lethality Toxicity Test is included in the metal casting sector monitoring program. These tests are required to determine the impact of the effluent on the biological life in the receiving stream and the degree of toxicity of the effluent.

Toxicity testing will be carried out on the following streams:

- process effluent streams
- combined effluent streams, and
- cooling water effluent streams with a potential for contamination, and
- cooling water effluent streams.

Monthly toxicity testing is required for process effluent streams that discharge directly to the receiving water. Toxicity testing will consist of the 96-hour Rainbow Trout Toxicity Test and the 46-hour LC50 Daphnia magna Acute Lethality Test.

Quarterly toxicity testing is required for combined effluent streams. When these streams are known to contain higher concentrations of contaminants and higher loadings, monthly toxicity testing is required.

During monthly toxicity testing, if three successive full dilution 96-hour Rainbow Trout Toxicity Tests prove non-toxic, subsequent rainbow trout toxicity tests may be conducted on full strength effluent only. If any subsequent full strength test shows the stream to be toxic, full dilution fish toxicity tests shall be required until the criterium has again been met. An effluent is defined as non-toxic if that effluent kills 20 percent or less of the rainbow trout at any dilution..

Quarterly toxicity testing is required for those plants that have cooling water effluent streams with a potential for contamination.

Plants that discharge only cooling water are required to conduct toxicity testing on a semi-annual basis. The low frequency of toxicity testing for cooling water effluent streams is justified because:

- cooling water is not used to cool process streams but it is used to cool one or more of the following: die casting machines, centrifugal molds, furnace parts, shell core molding machine parts, air compressors and hydraulic oil. The potential for continuous contamination of the cooling water is extremely limited.

- cooling water is taken from municipal water supplies and the use of algicides and slimicides is sometimes necessary.

- any leaks of process effluent to the cooling water will be detected by the chemical monitoring program, in which case the toxicity testing will be a useful check of the cooling water.

XV QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance and quality control (QA/QC) encompass all of the procedures undertaken to ensure that data produced are generated within known probability limits of accuracy and precision.

Quality assurance is the overall verification program which provides producers and users of data the assurance that predefined standards of quality at predetermined levels of confidence are met. Quality assurance is comprised of two elements: quality control and quality assessment.

Quality control is the overall system of guidelines, procedures and practices which are designed to regulate and control the quality of products or services with regards to previously established performance criteria and standards.

Quality assessment is the overall system of activities which ensures that quality control is being performed effectively. This is carried out immediately following quality control and involves evaluating and auditing quality control data to ensure the success of the quality control program.

QA/QC is one of the most important aspects of the MISA Effluent Monitoring Regulations. The QA/QC program includes many small but essential activities ranging from proving the cleanliness of sample bottles, using proper sampling equipment, containers and preservatives to instrument calibration; validation of authenticity of standards, inclusion of blanks, spikes and controls in analytical runs to documenting performance; participation in external round-robins to defining the proper method for reporting a final data number. Omission of one of these activities can lead to unreliable data resulting in improper conclusions and perhaps inappropriate actions being taken.

The financial stakes riding on the effluent monitoring regulation data are too high to compromise the generated data with inadequate QA/QC.

Quality control monitoring provides information about the quality of the effluent samples collected and whether contamination, either during sampling or transportation, has occurred. Quality control samples for the Metal Casting Effluent Monitoring Regulation will be collected at three process and two combined effluent streams.

Emphasis was placed on complex effluent streams which may contain a variety of organic and inorganic pollutants.

XVI MONITORING STRATEGY - SITE-SPECIFIC APPLICATION

The monitoring principles described previously have been applied to the sector to produce the site-specific monitoring schedules listed in the Metal Casting Sector Effluent Monitoring Regulation. The rationale for any deviations from these principles is described below.

A schematic diagram showing all sampling points for each plant is contained in Appendix C.

A. Acustar Canada Inc.

Acustar is required to monitor the cooling water effluent from their casting plant using the requirements for cooling water. There are no process effluents that discharge to this stream. In addition to these requirements, Acustar is required to monitor PCBs on a monthly basis since PCBs were detected during pre-regulation monitoring. Semi-annual toxicity testing is required.

B. The Bowmanville Foundry Company Limited

The Bowmanville Foundry is required to monitor the effluent containing the cooling water from their induction furnaces and site run-off using the requirements for cooling water. PCBs are required to be monitored quarterly since they are stored on-site. Semi-annual toxicity testing is required.

C. Canada Alloy Castings Ltd.,

Canada Alloy is required to monitor their cooling water effluent stream using the requirements for cooling water. There are no process effluents that discharge to this stream. Toxicity testing is required on a semi-annual basis.

D. Canada Pipe Company Ltd.,

Canada Pipe (Canron) is required to monitor three cooling water effluent streams and one combined effluent stream. Canada Pipe discharges these streams to a municipal storm collection system at various locations. The collection system is shared by other industries which necessitates that each effluent stream be monitored separately.

The four discharge points are the Cement Lining Sump Pit effluent, the Main Floor Drain Sump Pit effluent, the Accubar effluent and the Cupola Scrubber Sump Pit effluent.

The cement lining sump pit effluent and main floor drain sump pit effluent are required to be monitored using the requirements for cooling water effluent. PCBs are required to be monitored quarterly since they are stored on-site.

The accubar effluent is required to be monitored using the requirements for cooling water with the exception of phenolics and PCBs. The accubar effluent originates from a closed once-through cooling system for a continuous casting die. Contamination from phenolic resins and PCBs is not expected.

The cupola scrubber sump pit effluent is required to be monitored using the requirements for combined effluent with the quarterly characterizations and open characterization analyses and quarterly toxicity testing. This stream contains cooling water from the cupola and induction furnaces and intermittent overflows from the cupola gas scrubber system and slag quench tank. The cupola gas scrubber system is intended to be a 100% recirculating system, however, the system overflows when make up water exceeds the evaporation rate. This occurs when the cupola temperature falls. The slag quench tank also overflows when the make up water exceeds the evaporation rate.

E Crowe Foundry Ltd.,

Crowe Foundry is required to monitor their combined effluent stream using the requirements for combined effluent. However, combined effluent monitoring will be restricted to pH, suspended solids, phenolics and oil and grease. Crowe is also required to carry out quarterly characterization and open characterization analyses and quarterly toxicity testing.

Crowe uses water in the SO2 scrubber systems. After treatment for suspended solids, the tank overflow is discharged to the storm sewer. Storm water includes water draining from the roof and ground surface area surrounding the facility. Most of the treated scrubber water and the non-contact cooling water is recirculated.

F. Indusmin, Division of Falconbridge Limited (Fahramet)

Fahramet is required to monitor their cooling pond overflow using the requirements for cooling water effluent with a potential for contamination.

Fahramet discharges cooling waters from a sand cooling system, electric arc and induction furnaces and air compressors to a cooling pond for recirculation. Fahramet also discharges a mold wash tank overflow and quench tank to the cooling pond. This discharge amount is minor in comparison to the total cooling water component. The mold wash consists of an aqueous suspension of silicon dioxide, an inert solid. Quench tank wastes generally contain elevated levels of metals and solids and may contain some organics (17). For this reason, monitoring for organics that were detected in the sector pre-regulation monitoring program is required. PCBs are included in the quarterly characterization since they are stored on-site. Fahramet is also required to conduct quarterly characterization analyses and quarterly toxicity testing.

G. Ford Motor Company of Canada, Limited

Ford is required to monitor their foundry process effluent immediately after treatment using the requirements for process effluent and their combined effluent stream using the requirements for combined effluent. The combined effluent stream receives process effluent from the engine plant which by-passes the foundry wastewater treatment plant. This process effluent is discharged to the combined effluent stream along with cooling water and storm water.

Both effluent streams, process and combined, are required to conduct quarterly characterization and open characterization analyses. Toxicity testing is required for the combined effluent stream on a monthly basis.

H. Franklin Electric of Canada, Limited

Franklin is required to monitor their cooling pond overflow using the monitoring requirements for cooling water effluent with a potential for contamination.

Franklin discharges cooling water from air compressors, die casting machines and hydraulic fluid cooling systems to the cooling pond. Franklin also discharges a quench tank overflow and phosphate rinse tank overflow to the cooling pond. The amounts involved in these discharges are minor in comparison to the total cooling water component. Quench tank wastes generally contain elevated levels of metals and solids and may contain some organics (17). Phosphate rinses may contain residual phosphates and oils and greases removed from the surface of the castings. For this reason, monitoring for organics that were detected in the sector pre-regulation monitoring program is required. Quarterly characterization including analysis for PCBs which are stored on-site is required. Franklin is also required to carry out quarterly toxicity testing.

I. General Motors of Canada Limited

General Motors is required to monitor their foundry process effluent stream using the requirements for process effluent. Their combined effluent is to be monitored for the parameters associated with their process effluent, storm water effluent and cooling water effluent. This approach is considered necessary because the storm water that enters the combined effluent stream contains contaminants associated with process materials that are used on site. Pre-regulation monitoring data confirms this.

Monthly monitoring of process effluent for ammonia plus ammonium and fluorides is specified since these parameters were not detected at elevated levels during pre-regulation monitoring.

With respect to sampling frequency, the combined effluent stream monitoring requirements are a down graded version of the process effluent requirements. Parameters requiring daily monitoring under the process schedule will be monitored for thrice weekly. Thrice weekly process compounds will be monitored for weekly except for oil and grease which will remain thrice weekly. Oil and grease are monitored because they are considered the parameters most likely to contaminate the combined effluent stream. PCBs will be monitored monthly since they were detected in pre-regulation monitoring. Ammonia plus ammonium and total cyanide will be monitored monthly to coincide with toxicity testing. Characterization and open characterization will be undertaken on both streams, on a quarterly basis to identify non-EMPPL compounds.

J. Haley Industries Limited

Haley is required to monitor their process effluent stream using the requirements for process effluent and their storm water effluent stream using the requirements for storm water effluent. The process effluent stream is to be monitored for nitrates plus nitrites weekly since it receives nitric acid bath wastes. Ammonia plus ammonium is to be monitored for thrice weekly since high levels were detected in pre-regulation studies. Fluorides are to be monitored thrice weekly since high levels were detected during pre-regulation monitoring studies, and the effluent from the hydrofluoric acid treatment tanks is discharged to the same effluent stream.

Water soluble volatiles are to be monitored only during characterization. These compounds were not detected during pre-regulation monitoring and are not likely to be formed. Acrolein and acrylonitrile are formed by the decomposition of glycerine and acrylic resins respectively. These compounds are not used at this site.

K. Magalloy Limited

Magalloy is required to monitor their cooling tank effluent using the requirements for cooling water effluent. This stream contains cooling water from the induction furnaces and thermal sand reclamation system. PCBs are monitored quarterly because they are stored on site. The required toxicity testing is on a semi-annual basis.

L. Richmond Die Casting Ltd.

Richmond Die Casting is required to monitor their 30.5 cm (12 in) outlet sewer using the requirements for cooling water effluent. This stream receives cooling water from the die casting machines, air compressors and storm water from the site. Toxicity testing is required on a semi-annual basis.

M. Western Foundry Company Limited

Western Foundry is required to monitor their furnace cooling water sewer and core machine/compressor cooling water sewers using the requirements for cooling water. These effluent streams receive site run-off and cooling water from the induction furnaces, air compressors and one shell core machine. PCBs are required to be monitored quarterly since they are stored on-site. Toxicity testing is required on a semi-annual basis.

XVII MONITORING COSTS

The monitoring requirements under the MISA program will require both operating and capital expenditures. The Policy and Planning Branch of the Ministry has produced two reports which assess the economic environment of the metal casting sector and analyze the financial implications of the incremental costs of monitoring imposed by the MISA monitoring requirements.

The first report entitled "Metal Casting Industry Economic Profile" (9) contains an economic assessment and analysis of the metal casting sector based on publicly available data, information on domestic casting operations, company data on plants that are classified as direct dischargers, and market trends.

The report concludes that,

- profitability among casting manufacturers varies widely,
- competition among casting plants is strong,
- the industry appears to have stabilized after years of decline, and
- the outlook for the industry appears to be stable.

The second report entitled "Monitoring Costs and their Implications for Direct Dischargers in the Ontario Metal Casting Sector" (10) presents estimates and implications of the incremental costs to the metal casting plants of the effluent monitoring regulation requirements. These estimates were developed with the participation of industry.

Incremental capital costs for all metal casting plants which are direct dischargers subject to the MISA monitoring requirements are estimated to be $535 thousand.

Operating costs for all metal casting plants over the twelve month period of the regulation are estimated to be $ 884 thousand.

Total estimated incremental costs of the MISA monitoring requirements including both capital and operating expenses for the metal casting sector are estimated to be $1.4M. The total cost for the Metal Casting Sector plants has been reduced since public review, despite the addition of new companies and toxicity requirements. This is primarily due to savings made by Haley Industries through diversion of process water to an existing stream. Within the sector, the incremental costs including both capital and operating expenses range from a high of $496.1 thousand for Ford to a low of $10.8 thousand for Canada Alloy.

Estimates of the incremental costs by plant are presented in Table 8, Appendix B.

The metal casting sector monitoring requirements are pipe specific and based on a monitoring rationale developed solely for the metal casting sector. This approach was selected in order to eliminate unnecessary monitoring. If however, this pipe specific and sector specific approach was not used, total analytical and toxicity costs would be significantly higher. The Policy and Planning Branch of this Ministry estimated an alternate analytical and toxicity cost based on an "equitable" scenario (10). The following assumptions were used to develop this scenario:

- All effluent streams would be required to be monitored for a consistent set of parameters at the same frequency.
- Cooling water effluent streams containing small quantities of process effluent would be subjected to process effluent stream monitoring requirements.
- Cooling water effluent streams would be subjected to quarterly characterization and toxicity testing.

The "equitable" scenario resulted in analytical and toxicity costs ranging from $14,840 to $219,344 per plant. The total estimated analytical and toxicity cost of this scenario is $1,150,288. The estimated cost of this scenario represents a 77% increase over the total cost of the proposed regulation for these activities. The total cost for these activities for the proposed regulation is $651,070

The "equitable" scenario is estimated to cost over $499,218 more than the proposed regulation. Much of the additional cost burden would be borne by the mid-size and smaller plants. Canada Pipe's (Canron's) estimated cost for these activities would increase $115,801 from $38,391 to $154,192. The costs to Fahramet and Franklin would increase over $94,000 each. This analysis supports the cost-effectiveness of the pipe specific approach.

The financial impacts of the estimated monitoring costs are presented in Table 9, Appendix B. The impact assessment could not be applied to all companies in the sector since many of the companies are privately owned and refused to divulge financial records. These plants are aware of the cost of monitoring.

The financial impact of the estimated monitoring costs on those companies for which financial records are available varies greatly. The monitoring capital cost as a percent of the average annual capital expenditure for the period 1982 to 1987 ranges from a high of 3.2% for Bowmanville to a low of 0.001% for Acustar (owned by Chrysler U.S.). The monitoring operating cost as a percent of average annual after-tax earnings for the period 1982 to 1987 ranges from a high of 14.5% for Bowmanville to a low of 0.001% for Acustar. In fact in only one plant were operating costs greater than 5% of average annual after-tax earnings.

Potential benefits to the metal casting sector plants required to monitor include reductions to operating costs by reducing water usage and process material losses, and goodwill gained by demonstrating to the public that the company is responding to environmental problems.

The monitoring regulation may have a small, but positive impact on employment in the metal casting sector because extra staff may be required to take samples, maintain equipment and report data. The monitoring requirements will stimulate demand for laboratory services and flow measurement and sampling equipment. The monitoring data base will be available to design cost-effective control programs aimed at the virtual elimination of toxic contaminants.

XVIII REFERENCES

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APPENDIX A

SOURCES OF MONITORING DATA REVIEWED TO FORMULATE THE METAL CASTING SECTOR MONITORING REGULATION

1. Canviro Consultants, Pre-regulation monitoring studies at Ford Motor Company Limited, General Motors of Canada Limited, Acustar Canada Inc. and Haley Industries Limited, 1988.

2. Ministry of the Environment, Pre-regulation monitoring studies at Ford Motor Company Limited, General Motors of Canada Limited and Haley Industries Limited, 1988.

3. Environment Canada, Monitoring studies at Ford Motor Company Limited in December 1985 and November 1987 for the UGLCCS.

4. United States Environmental Protection Agency, Development Document for Effluent Limitations Guidelines and Standards for the Metal Molding and Casting (Foundries), Point Source Category, October 1985.

5. Ministry of the Environment, Report on the 1986 Industrial Direct Discharges in Ontario, October 1987 for Ford Motor Company Limited and General Motors of Canada Limited.

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7. Ministry of the Environment, Sampling results from Abatement studies at select sites including Canron Inc, Pipe Division and Western Foundry Company Limited, 1985 to 1987.

8. Regional Municipality of Waterloo, Storm sewer analysis from 1981 to 1988 for select industries including Alloy Casting Industries Limited, Bibby Ste. Croix Foundries Inc. and Crowe Foundry Limited.

APPENDIX B

TABLES

TABLE 1
LONG-TERM AVERAGE TREATMENT EFFECTIVENESS CONCENTRATIONS FOR ORGANIC PRIORITY POLLUTANTS (U.S.EPA)(17)

Parameter	LTATEC (ug/l)
acenaphthene	10
benzene	20
benzidine	22
carbon tetrachloride	20
chlorobenzene	20
1,2-dichloroethane	22
1,1,1-trichloroethane	20
1,1,2-trichloroethane	22
2,4,6-trichlorophenol	48
p-chloro-m-cresol	22
chloroform	78
2-chlorophenol	22
1,2-trans-dichloroethylene	22
2,4-dichlorophenol	48
2,4-dimethylphenol	10
ethylbenzene	20
fluoranthene	18
bis(2-chloroethoxy)methane	24
methylene chloride	59
methyl chloride	24
dichlorobromomethane	16
isophorone	16
naphthalene	24
2-nitrophenol	22
4-nitrophenol	22
2,4-dinitrophenol	10
4,6-dinitro-o-cresol	10
N-nitrosodiphenylamine	10
N-nitrosodi-n-propylamine	10
pentachlorophenol	14
phenol	18
bis(2-ethylhexyl) phthalate	32
butyl benzyl phthalate	10
di-n-butyl phthalate	22
di-n-octyl phthalate	22
diethyl phthalate	16
dimethyl phthalate	13
benzo(a)anthracene	10
benzo(a)pyrene	10

Parameter	LTATEC (ug/l)
3,4-benzofluoranthene	11
benzo(k)fluoranthene	14
chrysene	14
acenaphthalene	14
anthracene/phenanthrene	10
fluorene	10
pyrene	12
tetrachloroethylene	47
toluene	20
trichloroethylene	20

TABLE 2
PROBABILITY OF DETECTING AT LEAST ONE SAMPLE ABOVE THE DETECTION LIMIT

Single Sample Probability Of Detect/Non-Detect		Total Number of Samples					
p	q	12	10	8	6	4	2
0.5	0.5	.999	.999	.996	.984	.937	.750
0.4	0.6	.998	.994	.983	.953	.870	.640
0.3	0.7	.986	.972	.942	.882	.759	.510
0.2	0.8	.931	.893	.832	.738	.590	.360
0.1	0.9	.717	.651	.569	.468	.344	.190
0.01	0.99	.113	.095	.077	.058	.039	.019

TABLE 3: SUMMARY OF CHARACTERIZATIONS AND DIOXIN ANALYSES FOR THE METAL CASTING SECTOR PRE-REGULATION MONITORING PROGRAM

SITE	STREAM	NUMBER OF SAMPLES					
		EMPPL ORGANICS		OPEN ORGANIC SCANS		DIOXINS & FURANS	
		INDUSTRY	MOE	INDUSTRY	MOE	INDUSTRY	MOE
Acustar	Raw Water	1 *	-	-	-	-	-
	Cooling Water	3	-	1	-	1	-
General Motors	Intake	3	-	3	-	1	-
	Raw Process	3	1	3	1	1	1
	Combined	3	-	3	-	1	-
Ford	Intake	3	-	3	-	1	-
	Treated Process	3	1	3	1	1	1
	Combined	3	-	3	-	1	-
Haley	Intake	1	-	1	-	1	-
	S.E. Process	3	-	3	-	1	-
	N.E. Process	3	1	3	1	1	1

* Volatiles only

TABLE 4: FREQUENCY OF DETECTION OF COMPOUNDS ABOVE THE MDL IN ATGs 16-20, 23, 24, 26 AND 27 DURING PRE-REGULATION MONITORING STUDIES

ANALYTICAL TEST GROUP		PARAMETERS	GENERAL MOTORS			FORD			HALEY			ACUSTAR	
#	NAME		Intake	Raw Process	Combined	Intake	Treated Process	Combined	Intake	S.E. Process	N.E. Process	Raw Water	Cooling Water
16	Volatiles, Halogenated	1,1,2,2-Tetrachloroethane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		1,1,2-Trichloroethane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	2/3	1/4	0/1	0/3
		1,1-Dichloroethane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	3/3	1/4	0/1	0/3
		1,1-Dichloroethylene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	3/3	0/4	0/1	0/3
		1,2-Dichlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	1/4	0/1	0/3
		1,2-Dichloroethane (Ethylene dichloride)	0/3	0/4	0/3	0/3	0/4	0/3	0/1	2/3	0/4	0/1	0/3
		1,2-Dichloropropane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		1,3-Dichlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		1,4-Dichlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Bromoform	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Bromomethane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Carbon tetrachloride	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Chlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	1/4	0/1	0/3
		Chloroform	0/3	1/4	2/3	0/3	0/4	1/3	0/1	0/3	0/4	1/1	3/3
		Chloromethane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Cis-1,3-Dichloropropylene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Dibromochloromethane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	1/1	2/3
		Ethylene dibromide	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Methylene chloride	3/3	3/4	3/3	3/3	4/4	3/3	1/1	3/3	3/4	0/1	2/3
		Tetrachloroethylene (Perchloroethylene)	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Trans-1,2-Dichloroethylene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Trans-1,3-Dichloropropylene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Trichloroethylene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	2/3	0/4	0/1	0/3
		Trichlorofluoromethane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
		Vinyl chloride (Chloroethylene)	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	0/1	0/3
17	Volatiles, Non-Halogenated	Benzene	0/3	2/4	0/3	0/3	4/4	1/3	0/1	1/3	1/4	0/1	0/3
		Styrene	0/3	1/4	0/3	0/3	3/4	0/3	0/1	0/3	0/4	0/1	0/3
		Toluene	3/3	4/4	2/3	3/3	4/4	2/3	0/1	2/3	3/4	1/1	3/3
		o-Xylene	0/3	4/4	0/3	0/3	1/4	0/3	0/1	2/3	2/4	0/1	0/3
		m-Xylene and p-Xylene	0/3	4/4	0/3	0/3	2/4	1/3	0/1	3/3	3/4	0/1	0/3
18	Volatiles, Water Soluble	Acrolein	0/3	0/3	0/3	0/3	0/3	0/3	0/1	0/3	0/3	0/1	0/3
		Acrylonitrile	0/3	2/3	0/3	0/3	2/3	0/3	0/1	0/3	0/3	0/1	0/3

TABLE 4: FREQUENCY OF DETECTION OF COMPOUNDS ABOVE THE MDL IN ATGs 16-20, 23, 24, 26 AND 27 DURING PRE-REGULATION MONITORING STUDIES

ANALYTICAL TEST GROUP #	ANALYTICAL TEST GROUP NAME	PARAMETERS	GENERAL MOTORS			FORD			HALEY			ACUSTAR	
			Intake	Raw Process	Combined	Intake	Treated Process	Combined	Intake	S.E. Process	N.E. Process	Raw Water	Cooling Water
19	Extractables, Base Neutral	Acenaphthene	0/3	3/4	2/3	0/3	1/4	0/3	0/1	1/3	0/4	NA	0/3
		5-nitro Acenaphthene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Acenaphthylene	0/3	3/4	3/3	0/3	1/4	0/3	0/1	0/3	0/4	NA	0/3
		Anthracene	0/3	3/4	0/3	0/3	1/4	1/3	0/1	2/3	2/4	NA	0/3
		Benz(a)anthracene	0/3	2/4	0/3	0/3	0/4	0/3	0/1	0/3	1/4	NA	0/3
		Benzo(a)pyrene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Benzo(b)fluoranthene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	1/4	NA	0/3
		Benzo(g,h,i)perylene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Benzo(k)fluoranthene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	1/4	NA	0/3
		Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Camphene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		1-Chloronaphthalene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2-Chloronaphthalene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Chrysene	0/3	3/4	0/3	0/3	1/4	0/3	0/1	0/3	1/4	NA	0/3
		Dibenz(a,h)anthracene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Fluoranthene	0/3	3/4	1/3	0/3	2/4	0/3	0/1	2/3	2/4	NA	0/3
		Fluorene	1/3	3/4	3/3	0/3	2/4	1/3	0/1	2/3	0/4	NA	0/3
		Indeno(1,2,3-cd)pyrene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	1/4	NA	0/3
		Indole	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		1-Methylnaphthalene	0/3	3/4	1/3	0/3	1/4	1/3	0/1	1/3	0/4	NA	0/3
		2-Methylnaphthalene	0/3	1/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Naphthalene	1/3	4/4	1/3	0/3	1/4	1/3	0/1	2/3	0/4	NA	0/3
		Perylene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Phenanthrene	0/3	3/4	2/3	0/3	2/4	2/3	0/1	3/3	2/4	NA	0/3
		Pyrene	0/3	3/4	0/3	0/3	2/4	0/3	0/1	1/3	2/4	NA	0/3
		Benzyl butyl phthalate	0/3	1/4	0/3	0/3	1/4	1/3	0/1	0/3	1/4	NA	0/3
		Bis(2-ethylhexyl) phthalate	3/3	3/4	3/3	3/3	3/4	3/3	1/1	3/3	4/4	NA	3/3
		Di-n-butyl phthalate	2/3	2/4	1/3	1/3	1/4	1/3	1/1	1/3	1/4	NA	1/3
		4-Bromophenyl phenyl ether	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Chlorophenyl phenyl ether	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Bis(2-chloroisopropyl)ether	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Bis(2-chloroethyl)ether	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Diphenyl ether	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,4-Dinitrotoluene	0/3	1/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,6-Dinitrotoluene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3

TABLE 4: FREQUENCY OF DETECTION OF COMPOUNDS ABOVE THE MDL IN ATGs 16-20, 23, 24, 26 AND 27 DURING PRE-REGULATION MONITORING STUDIES

ANALYTICAL TEST GROUP		PARAMETERS	GENERAL MOTORS			FORD			HALEY			ACUSTAR	
#	NAME		Intake	Raw Process	Combined	Intake	Treated Process	Combined	Intake	S.E. Process	N.E. Process	Raw Water	Cooling Water
19	Extractables, Base Neutral (continued)	Bis(2-chloroethoxy)methane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Diphenylamine	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		N-Nitrosodiphenylamine	0/3	1/4	0/3	0/3	0/4	1/3	0/1	1/3	1/4	NA	0/3
		N-Nitrosodi-n-propylamine	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	1/3
20	Extractables, Acid (Phenolics)	2,3,4,5-Tetrachlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,3,4,6-Tetrachlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,3,5,6-Tetrachlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,3,4-Trichlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,3,5-Trichlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,4,5-Trichlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,4,6-Trichlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,4-Dimethyl phenol	0/3	3/4	3/3	0/3	2/4	1/3	0/1	3/3	1/4	NA	0/3
		2,4-Dinitrophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,4-Dichlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,6-Dichlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		4,6-Dinitro-o-cresol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2-Chlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		4-Chloro-3-methylphenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		4-Nitrophenol	0/3	2/4	0/3	0/3	1/4	0/3	0/1	2/3	0/4	NA	0/3
		m-Cresol	0/3	3/4	0/3	0/3	2/4	1/3	0/1	2/3	0/4	NA	0/3
		o-Cresol	0/3	3/4	1/3	0/3	1/4	1/3	0/1	2/3	0/4	NA	0/3
		p-Cresol	1/3	3/4	0/3	0/3	1/4	1/3	0/1	2/3	1/4	NA	0/3
		Pentachlorophenol	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Phenol	2/3	3/4	2/3	1/3	2/4	1/3	0/1	3/3	2/4	NA	0/3
23	Extractables, Neutral -Chlorinated	1,2,3,4-Tetrachlorobenzene	0/3	1/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		1,2,3,5-Tetrachlorobenzene	0/3	1/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		1,2,4,5-Tetrachlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		1,2,3-Trichlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		1,2,4-Trichlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		2,4,5-Trichlorotoluene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Hexachlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Hexachlorobutadiene	0/3	0/4	0/3	0/3	1/4	0/3	0/1	0/3	0/4	NA	0/3
		Hexachlorocyclopentadiene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Hexachloroethane	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Octachlorostyrene	0/3	1/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3
		Pentachlorobenzene	0/3	0/4	0/3	0/3	0/4	0/3	0/1	0/3	0/4	NA	0/3

TABLE 4: FREQUENCY OF DETECTION OF COMPOUNDS ABOVE THE MDL IN ATGs 16-20, 23, 24, 26 AND 27 DURING PRE-REGULATION MONITORING STUDIES

ANALYTICAL TEST GROUP #	NAME	PARAMETERS	GENERAL MOTORS Intake	GENERAL MOTORS Raw Process	GENERAL MOTORS Combined	FORD Intake	FORD Treated Process	FORD Combined	HALEY Intake	HALEY S.E. Process	HALEY N.E. Process	ACUSTAR Raw Water	ACUSTAR Cooling Water
24	Chlorinated Dibenzo-p-dioxins and Dibenzofurans	2,3,7,8-Tetrachlorodibenzo-p-dioxin	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Octachlorodibenzo-p-dioxin	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Octachlorodibenzofuran	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Total heptachlorinated dibenzo-p-dioxins	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Total heptachlorinated dibenzofurans	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Total hexachlorinated dibenzo-p-dioxins	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Total hexachlorinated dibenzofurans	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Total pentachlorinated dibenzo-p-dioxins	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Total pentachlorinated dibenzofurans	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Total tetrachlorinated dibenzo-p-dioxins	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
		Total tetrachlorinated dibenzofurans	0/1	0/2	0/1	0/1	0/2	0/1	0/1	0/1	0/2	NA	0/1
26	Fatty and Resin Acids	Abietic acid	NA	NA	NA	NA	0/1	NA	NA	NA	0/1	NA	NA
		Chlorodehydroabietic acid	NA	NA	NA	NA	0/1	NA	NA	NA	0/1	NA	NA
		Dehydroabietic acid	NA	NA	NA	NA	0/1	NA	NA	NA	0/1	NA	NA
		Isopimaric acid	NA	NA	NA	NA	0/1	NA	NA	NA	0/1	NA	NA
		Levopimaric acid	NA	NA	NA	NA	0/1	NA	NA	NA	0/1	NA	NA
		Neoabietic acid	NA	NA	NA	NA	0/1	NA	NA	NA	0/1	NA	NA
		Oleic acid	NA	NA	NA	NA	1/1	NA	NA	NA	1/1	NA	NA
		Pimaric acid	NA	NA	NA	NA	0/1	NA	NA	NA	0/1	NA	NA
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)	0/3	3/4	0/3	0/3	1/4	1/3	0/1	0/3	1/4	NA	1/3

NA - Not Analysed

TABLE 5: NUMBER OF COMPOUNDS DETECTED ABOVE MDL FOR ANALYTICAL TEST GROUPS 16-20, 23, 24, 26 AND 27 DURING THE METAL CASTING SECTOR PRE-REGULATION MONITORING PROGRAM

ANALYTICAL TEST GROUP		ACUSTAR	GENERAL MOTORS		FORD		HALEY	
#	NAME	COOLING WATER	PROCESS	COMBINED	PROCESS	COMBINED	NE PROCESS	SE PROCESS
16	Volatiles, Halogenated	3 *	2	2	1	2	5	6
17	Volatiles, Non-Halogenated	1 *	5	1	5	3	4	4
18	Volatiles, Water Soluble	0	1	0	1	0	0	0
19	Extractables, Base Neutral	3 *	17	9	13	9	13	11
20	Extractables, Acid (Phenolics)	0	6	3	6	5	3	6
23	Extractables, Neutral -Chlorinated	0	3(X)(Y)	0	1(X)	0	0	0
24	Chlorinated Dibenzo-p-dioxins and Dibenzofurans	0	0	0	0	0	0	0
26	Fatty & Resin Acids	NA	NA	NA	1	NA	1	NA
27	PCBs (Total)	YES	YES	YES	YES	YES	YES	NO

* - Also detected in raw water at similar concentrations or possible interference

(X) - Detected in one sample only by MOE at low concentrations

(Y) - Chromatograms complicated, lab could not confirm results

NA - Not analyzed

TABLE 6: COMPOUNDS IN ATGs 16-20, 23, 24 AND 26 DETECTED ABOVE US EPA LONG-TERM AVERAGE TREATMENT EFFECTIVENESS CONCENTRATIONS IN PROCESS EFFLUENTS DURING PRE-REGULATION MONITORING STUDIES

ANALYTICAL TEST GROUP		PARAMETERS	Company	Average Concentration (µg/L)	Range (µg/L)	Long-Term Average Treatment Effectiveness Concentration (µg/L) (BAT)*
#	NAME					
17	Volatiles, Non-Halogenated	Toluene	Haley - NE	9.3	1.5 - 23.2	20
19	Extractables, Base Neutral	Phenanthrene	General Motors	15.3†	6 - 29.2	10
		Bis(2-ethylhexyl) phthalate	Haley - NE	38.8	11 - 91.7	32
		N-Nitrosodiphenylamine	General Motors	6.2†	<0.9 - 17.8	10
20	Extractables, Acid (Phenolics)	2,4-Dimethyl phenol	General Motors	38.7†	27.8 - 46.1	10
			Ford	7.6	<0.5 - 22.3	10
		Phenol	Haley - SE	355.5	47.6 - 868	18
			Ford	45.3	<0.5 - 135.4	18
			General Motors	30.2†	9.6 - 70	18

* - based on oil removal by skimming and chemical addition plus settling

† - detected in process effluent before treatment

TABLE 7: SUMMARY OF MONITORING RESULTS FOR CONVENTIONAL PARAMETERS AT FORD'S WINDSOR CASTING PLANT (FINAL EFFLUENT) BASED ON ENVIRONMENT CANADA'S MONITORING FOR THE UGLCCS DURING DECEMBER 1985 AND NOVEMBER 1987

	1985				1987			
PARAMETER	# OF SAMPLES	MEAN (mg/l)	STANDARD DEVIATION (UNBIASED)	CO-EFFICIENT OF VARIATION	# OF SAMPLES	MEAN (mg/l)	STANDARD DEVIATION (UNBIASED)	CO-EFFICIENT OF VARIATION
Total Phenols	5	648 µg/l	613	0.95*	7	747 µg/l	182	0.24
Oil & Grease	5	3.08	0.48	0.16*	-			
Ammonia	5	0.76	0.35	0.46*	-			
Suspended Solids	5	35.8	5.5	0.15	7	13.3	12.3	0.92*
METALS:								
Aluminum	-	-	-	-	7	1.95	0.28	0.14
Copper	5	0.056	0.009	0.16	7	0.064	0.019	0.3
Chromium	5	0.0124	0.0005	0.04	7	0.0178	0.0037	0.21
Iron	5	4.7	0.19	0.036	7	4.3	1.09	0.25
Lead	5	0.4	0.05	0.12	7	0.52	0.22	0.42
Mercury	5	N.D.	-	-	7	0.088	0.037	0.42
Zinc	5	1.89	0.26	0.14	7	2.23	1.09	0.49*

* - Highest Value
N.D. - Not Detected

TABLE 8

ESTIMATES OF THE INCREMENTAL COSTS BY PLANT FOR THE METAL CASTING SECTOR

Plant	Location	1989 $ IN THOUSANDS Operating	Capital	Total
Acustar	Etobicoke	13.6	22.5	36.1
Bowmanville	Bowmanville	10.0	1.6	11.6
Canada Alloy	Kitchener	9.1	1.7	10.8
Canada Pipe	Hamilton	54.3	11.8	66.1
Crowe	Cambridge	29.9	15.6	45.5
Fahramet	Orillia	16.5	6.6	23.1
Ford	Windsor	316.1	180.0	496.1
Franklin	Strathroy	16.4	2.3	18.7
G.M.	St. Catharines	218.5	238.0	456.5
Haley	Haley Station	160.2	50.0	210.2
Magalloy	Stratford	8.9	1.6	10.5
Richmond	Cornwall	14.4	1.7	16.1
Western	Wingham	15.8	1.6	17.4
TOTALS (rounded)		884.0	535.0	1,419.0

TABLE 9

IMPACT OF MONITORING COSTS ON SELECTED FINANCIAL INDICATORS
(1982 - 1987)

PLANT	CAPITAL EXPENDITURES			AFTER-TAX EARNINGS		
	Monitoring Capital Cost as a % of Annual Average Capital Expenditure			Monitoring Operating Cost as a % of Annual Average After-Tax Earnings (Loss)		
	Highest Year	Lowest Year	Average Over 1982-87	Highest Year	Lowest Year	Average Cost 1982-87
BOWMANVILLE	1.203	160.0	3.200	6.211	(17.544)	14.493
CANADA PIPE (Canron) (1)	0.027	0.216	0.054	0.360	(0.160)	4.555
CHRYSLER U.S. (Acustar)	0.001	0.005	0.001	0.000	0.006	0.001
INDUSMIN (Fahramet) (2)	0.109	0.189	0.144	0.244	1.871	0.414
FRANKLIN U.S.	0.036	0.079	0.046	0.168	0.289	0.224
FORD	0.031	0.078	0.530	0.106	(0.293)	0.273
GENERAL MOTORS	0.018	0.089	0.037	0.025	(0.305)	0.050
HALEY	1.178	5.701	2.385	2.487	7.950	4.546

Source: Monitoring Costs and their Implications for Direct Dischargers in the Ontario Metal Casting Sector, 1989.

Note: (1) Canron Pipe Co. Ltd. has changed name and ownership. It is now Canada Pipe Company Ltd. a wholly owned subsidiary of McWane Inc. located in Birmingham, Alabama. For the purpose of this report we have continued to use Canron financial data.

(2) Capital expenditure and earning figures represent those of the Indusmin Division and were obtained from Falconbridge financial statement.

APPENDIX C

FIGURES

FIGURE 1 - ACUSTAR CANADA INC,

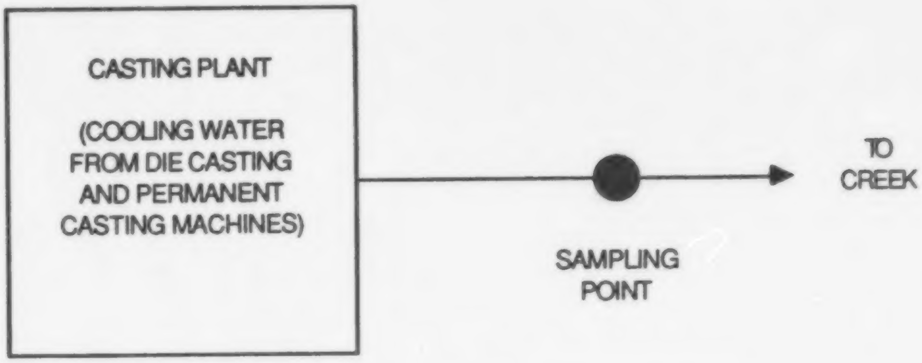

CASTING PLANT
(COOLING WATER FROM DIE CASTING AND PERMANENT CASTING MACHINES)
SAMPLING POINT
TO CREEK

FIGURE 2 - THE BOWMANVILLE FOUNDRY CO. LTD

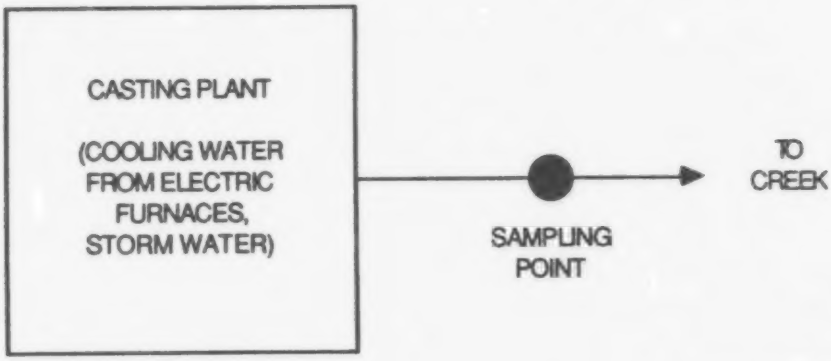

CASTING PLANT
(COOLING WATER FROM ELECTRIC FURNACES, STORM WATER)
SAMPLING POINT
TO CREEK

FIGURE 3 - CANADA ALLOY CASTINGS, LTD

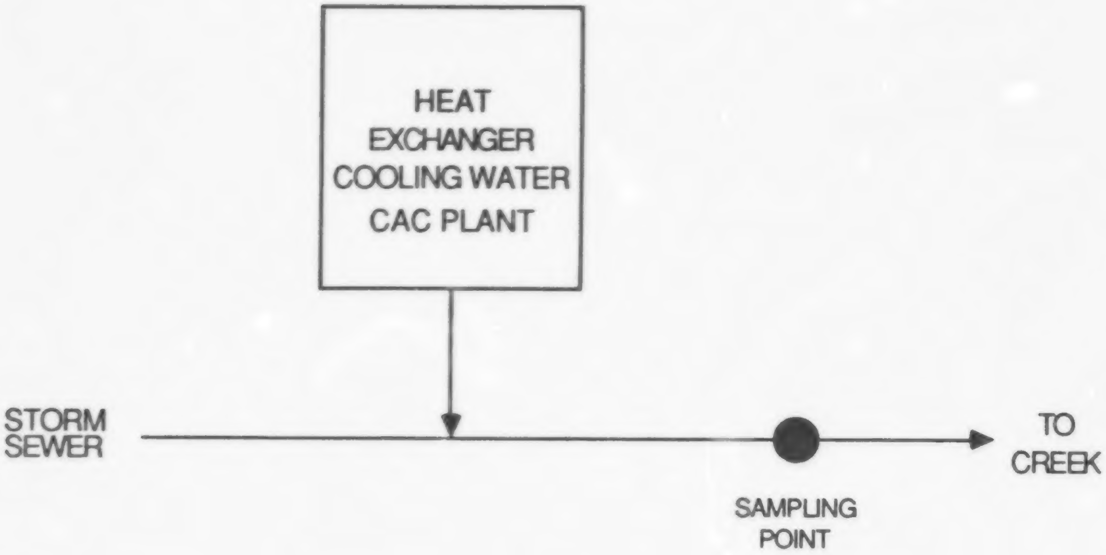
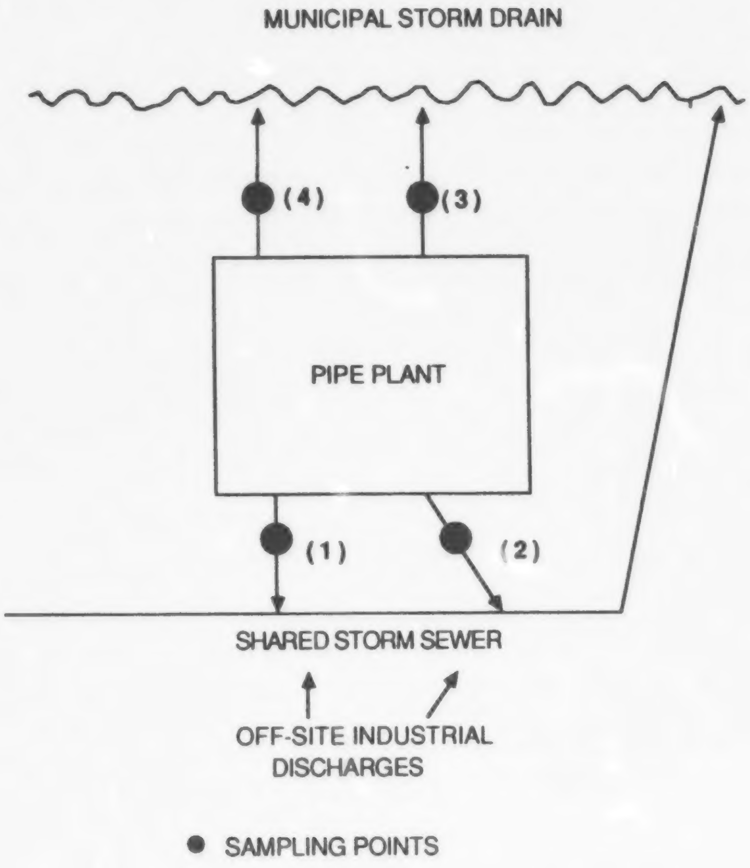

HEAT EXCHANGER COOLING WATER CAC PLANT
STORM SEWER
SAMPLING POINT
TO CREEK

FIGURE 4 - CANADA PIPE COMPANY LTD.


MUNICIPAL STORM DRAIN
(4)
(3)
PIPE PLANT
(1)
(2)
SHARED STORM SEWER
OFF-SITE INDUSTRIAL DISCHARGES
● SAMPLING POINTS

(1) Cement Lining Sump Pit Effluent
- floor drains from cement lining area

(2) Cupola Scrubber Sump Pit Effluent
- cooling water from cupola shell and induction furnaces
- slag quench tank and cupola scrubber tank overflows

(3) Accubar Effluent
- cooling water from continous casting die

(4) Main Floor Drain Sump Pit Effluent
- cooling water from centrifugal casting machines

FIGURE 5 - CROWE FOUNDRY LIMITED

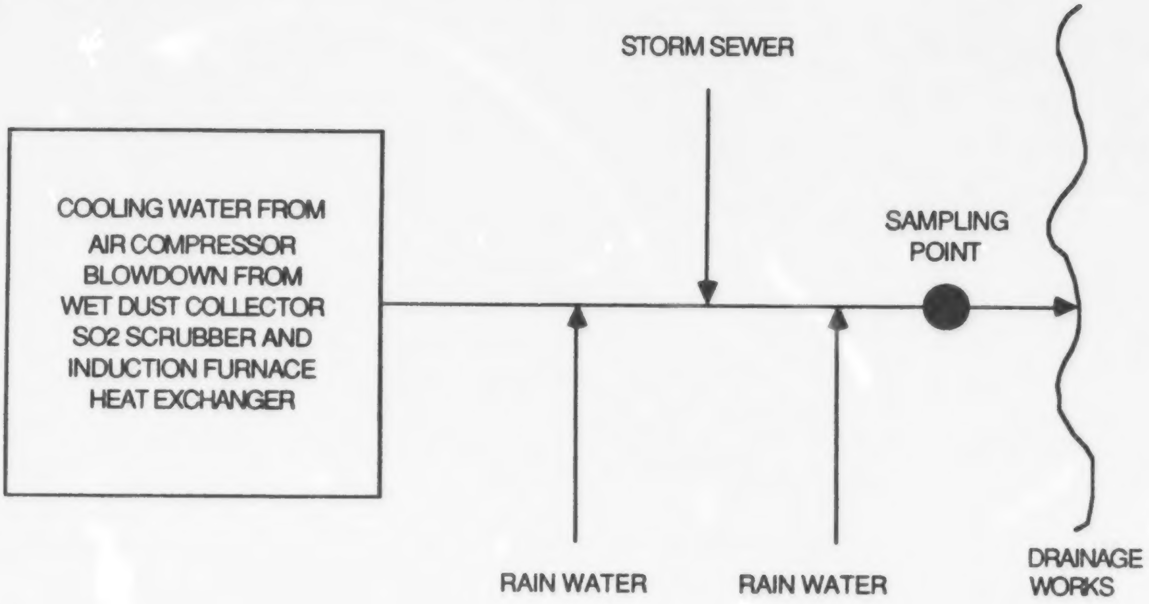

STORM SEWER
COOLING WATER FROM AIR COMPRESSOR BLOWDOWN FROM WET DUST COLLECTOR SO2 SCRUBBER AND INDUCTION FURNACE HEAT EXCHANGER
SAMPLING POINT
RAIN WATER
RAIN WATER
DRAINAGE WORKS

FIGURE 6 - INDUSMIN, DIVISION OF FALCONBRIDGE LIMITED (FAHRAMET)

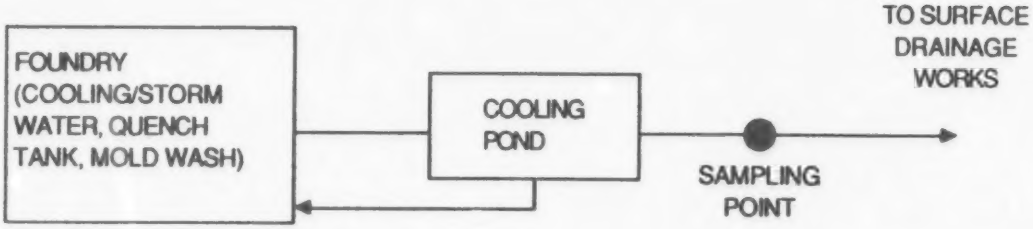

TO SURFACE DRAINAGE WORKS
FOUNDRY (COOLING/STORM WATER, QUENCH TANK, MOLD WASH)
COOLING POND
SAMPLING POINT

FIGURE 7 - FORD MOTOR COMPANY OF CANADA, LTD.

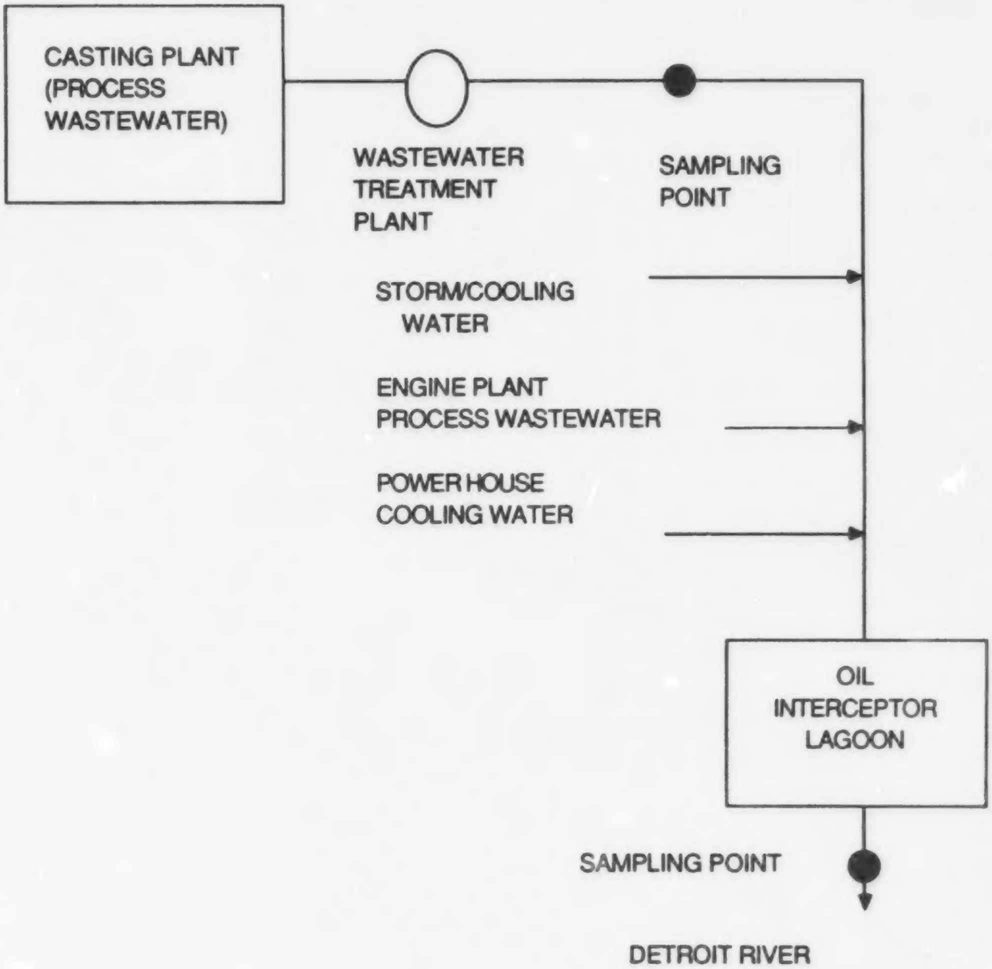

CASTING PLANT (PROCESS WASTEWATER)
WASTEWATER TREATMENT PLANT
SAMPLING POINT
STORM/COOLING WATER
ENGINE PLANT PROCESS WASTEWATER
POWER HOUSE COOLING WATER
OIL INTERCEPTOR LAGOON
SAMPLING POINT
DETROIT RIVER

FIGURE 8 - FRANKLIN ELECTRIC OF CANADA, LTD

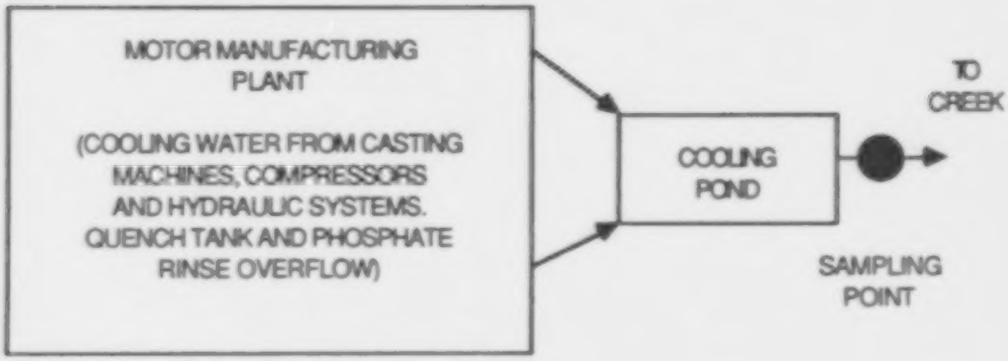

MOTOR MANUFACTURING PLANT
(COOLING WATER FROM CASTING MACHINES, COMPRESSORS AND HYDRAULIC SYSTEMS. QUENCH TANK AND PHOSPHATE RINSE OVERFLOW)
COOLING POND
TO CREEK
SAMPLING POINT

FIGURE 9 - GENERAL MOTORS OF CANADA LTD

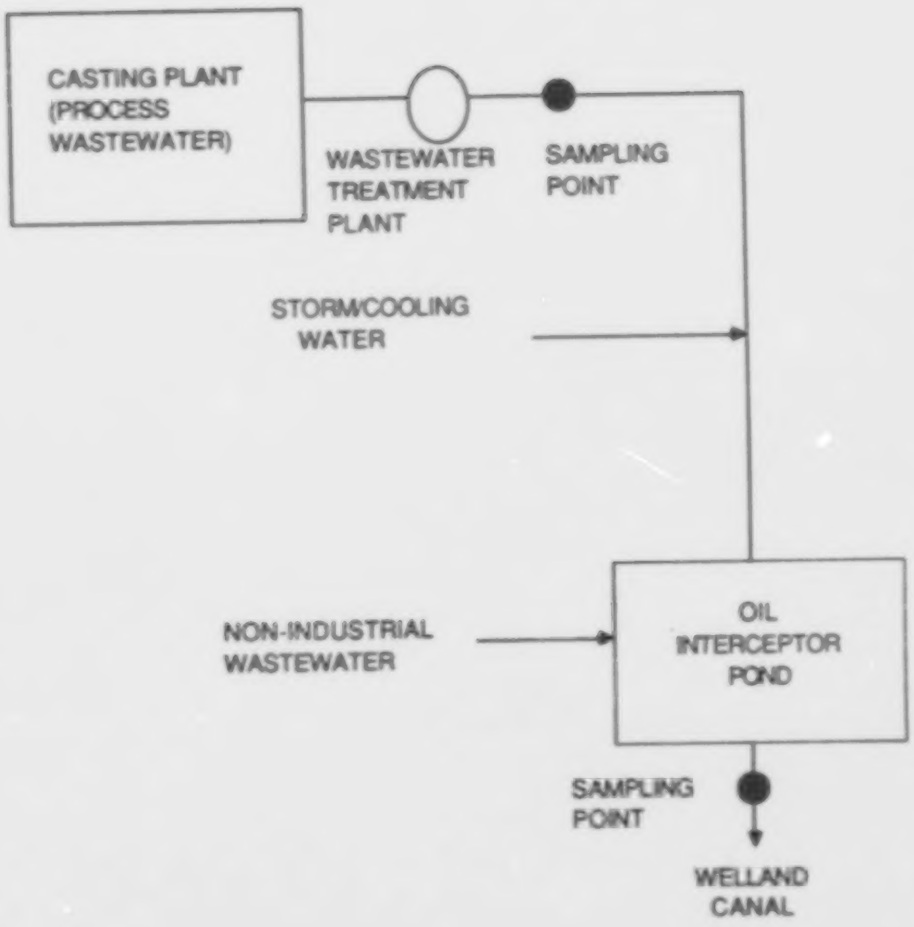

CASTING PLANT (PROCESS WASTEWATER)
WASTEWATER TREATMENT PLANT
SAMPLING POINT
STORM/COOLING WATER
NON-INDUSTRIAL WASTEWATER
OIL INTERCEPTOR POND
SAMPLING POINT
WELLAND CANAL

FIGURE 10 - HALEY INDUSTRIES LTD

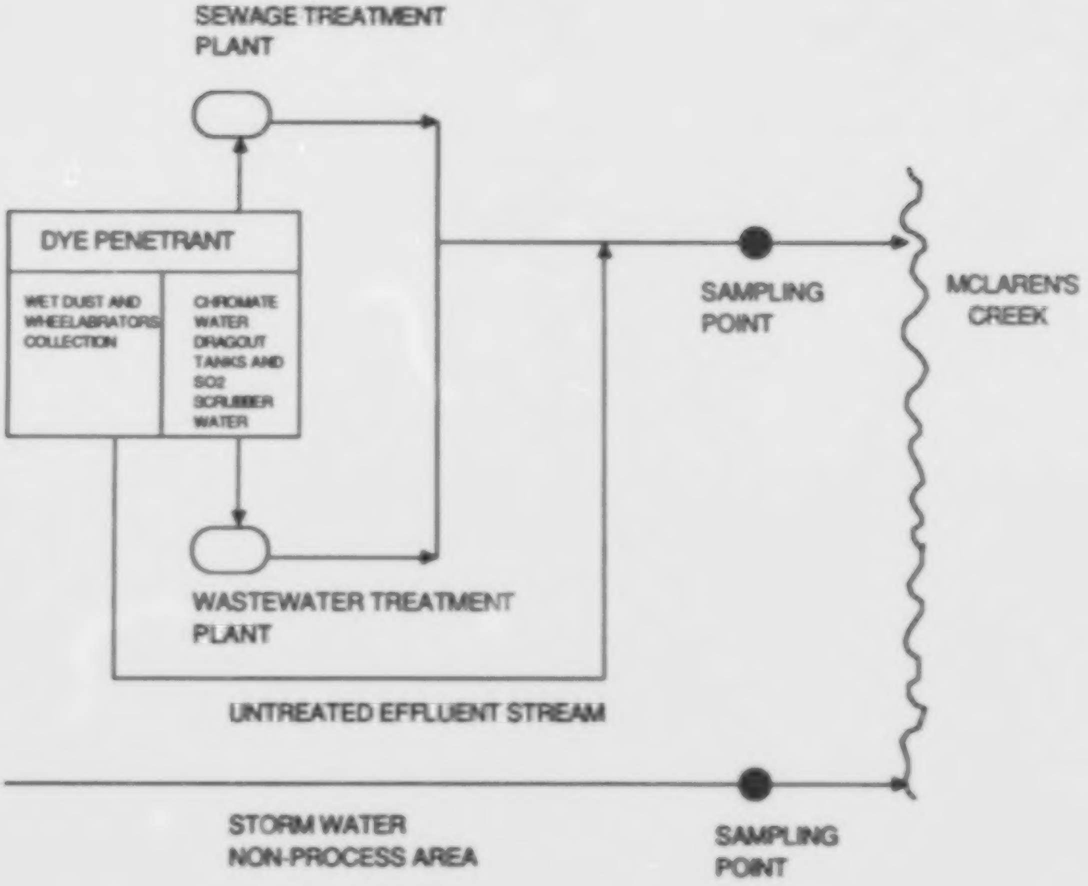

SEWAGE TREATMENT PLANT
DYE PENETRANT
WET DUST AND WHEELABRATORS COLLECTION
CHROMATE WATER DRAGOUT TANKS AND SO2 SCRUBBER WATER
WASTEWATER TREATMENT PLANT
UNTREATED EFFLUENT STREAM
SAMPLING POINT
MCLAREN'S CREEK
STORM WATER NON-PROCESS AREA
SAMPLING POINT

FIGURE 11 - MAGALLOY LTD

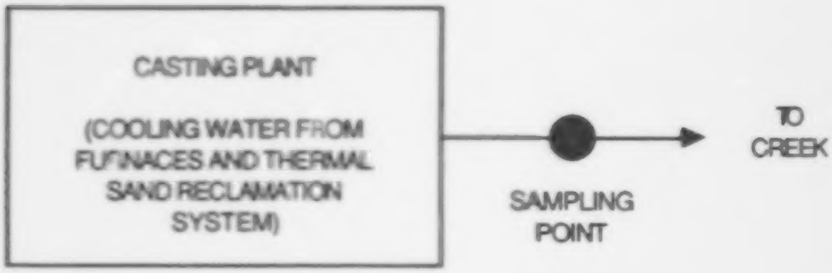

CASTING PLANT
(COOLING WATER FROM FURNACES AND THERMAL SAND RECLAMATION SYSTEM)
SAMPLING POINT
TO CREEK

FIGURE 12 - RICHMOND DIE CASTING LTD

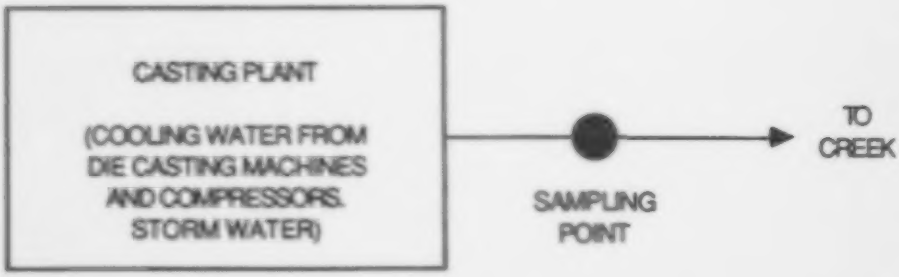
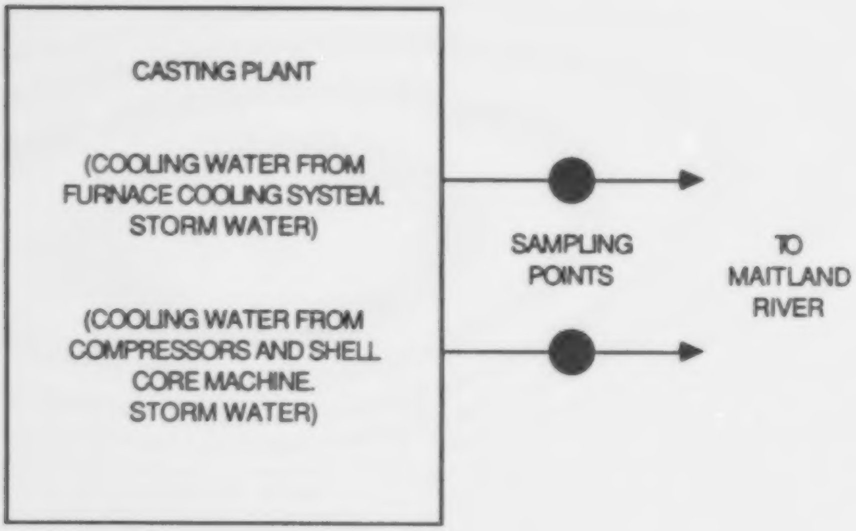

CASTING PLANT
(COOLING WATER FROM DIE CASTING MACHINES AND COMPRESSORS. STORM WATER)
SAMPLING POINT
TO CREEK

FIGURE 13 - WESTERN FOUNDRY COMPANY LIMITED


CASTING PLANT
(COOLING WATER FROM FURNACE COOLING SYSTEM. STORM WATER)
(COOLING WATER FROM COMPRESSORS AND SHELL CORE MACHINE. STORM WATER)
SAMPLING POINTS
TO MAITLAND RIVER

PART III

THE EFFLUENT MONITORING REGULATION FOR THE METAL CASTING SECTOR

ONTARIO REGULATION 648/89

PART III - THE EFFLUENT MONITORING REGULATION FOR THE METAL CASTING SECTOR

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REGULATION MADE UNDER
ENVIRONMENTAL PROTECTION ACT

EFFLUENT MONITORING - METAL CASTING SECTOR

Definitions

1.-(1) In this Regulation,

"characterization" in relation to a plant, means the analysis of a sample to identify and quantify all of the parameters specified in the characterization parameters schedule for that plant, except those in analytical test group 24;

"combined effluent" means effluent resulting from the intentional combination of process effluent with cooling water or storm water;

"cooling water " means water and associated material that is used in an industrial process for the purpose of removing heat, that is not intended to come into contact with process materials, and that is discharged directly to a surface watercourse;

"cooling water effluent stream" means cooling water that flows through an open or closed channel;

"cooling water sampling point" means a location in a cooling water effluent stream situated before the place of discharge to a surface watercourse;

"General Effluent Monitoring Regulation" means Ontario Regulation 695/88;

"grab sample" means a volume of effluent of at least 100 millilitres that is collected over a period not exceeding fifteen minutes and immediately transferred to the appropriate laboratory sample container as set out in Column 2 of Schedule 2 to the General Effluent Monitoring Regulation and in Column 2 of Schedule CC to this Regulation;

"process change" means a change in equipment, production process, raw materials or treatment process;

"quarterly" means once in each three month period beginning on the first day of January, April, July and October;

"semi-annually" means once in each six month period beginning on the first day of January and July;

(2) The definitions in section 1 of the General Effluent Monitoring Regulation that are not redefined in this Regulation apply to this Regulation.

(3) Where a term is defined in this Regulation and in the General Effluent Monitoring Regulation, the definition in this Regulation applies to the General Effluent Monitoring Regulation insofar as that Regulation governs direct dischargers to which this Regulation applies.

Purpose

2. The purpose of this Regulation is to establish a data base on effluent quality in the metal casting sector that, along with other pertinent information, will be used in the development of effluent limits for the metal casting sector.

Application

3.-(1) This Regulation applies only with respect to the plants listed in subsection (2) and only with respect to the effluent streams named in the site-specific monitoring schedules for those plants.

(2) The characterization parameters schedule and the site-specific monitoring schedule for each plant are as follows:

tem	Plant	Location	Owner as of the 27th of September, 1989	Characterization Parameters Schedule	Storm Event Reporting Required	Site-Specific Monitorin Schedule
1	**Etobicoke Casting Division**	**Etobicoke**	Acustar Canada Inc.	None	No	**A**
2	**Bowmanville Foundry**	**Bowmanville**	The Bowmanville Foundry Company, Limited	None	No	**B**
3	**Canada Alloy Castings**	**Kitchener**	Canada Alloy Castings, Ltd.	None	No	**C**
4	**Canada Pipe**	**Hamilton**	Canada Pipe Company Ltd.	BB	Yes	**D**
5	**Crowe Foundry**	**Cambridge**	Crowe Foundry Limited	BB	Yes	**E**
6	**Fahramet**	**Orillia**	Indusmin, Division of Falconbridge Limited	BB	Yes	**F**
7	**Ford Motors**	**Windsor**	Ford Motor Company of Canada, Limited	AA	Yes	**G**
8	**Franklin Electric**	**Strathroy**	Franklin Electric of Canada, Limited	BB	Yes	**H**
9	**General Motors**	**St.Catharines**	General Motors of Canada Limited	AA	Yes	**I**
10	**Haley Industries**	**Haley Station**	Haley Industries Limited	AA	Yes	**J**
11	**Magalloy**	**Stratford**	Magalloy Limited	None	No	**K**
12	**Richmond Die Casting**	**Cornwall**	Richmond Die Casting Ltd.	None	No	**L**
13	**Western Foundry**	**Wingham**	Western Foundry Company Limited	None	No	**M**

(3) This Regulation is a Sectoral Effluent Monitoring Regulation within the meaning of the General Effluent Monitoring Regulation.

(4) Each direct discharger shall carry out the monitoring obligations, including the sampling, analysis, toxicity testing, flow measurement, recording and reporting obligations of this Regulation, in accordance with the General Effluent Monitoring Regulation and in accordance with the sampling principles specified in Schedule CC to this Regulation and the analytical principles specified in Schedule DD to this Regulation.

(5) Each direct discharger shall carry out the monitoring obligations of this Regulation using the analytical method detection limits specified in column 6 of Schedule 3 to the General Effluent Monitoring Regulation and in Schedule DD to this Regulation.

(6) Each direct discharger shall carry out the sampling and analytical obligations in relation to biphenyl and diphenyl ether in accordance with Notes 3 and 4 to the Characterization Parameters Schedule for that discharger's plant.

(7) In addition to complying with subsection 3(19) of the General Effluent Monitoring Regulation, every direct discharger shall use only sampling equipment for the collection of samples, the wettable surfaces of which are made of,

(a) fluorocarbon resins, glass or stainless steel for samples that are to be analyzed for parameters in analytical test group 26 as set out in Schedule AA; and

(b) fluorocarbon resins, glass, stainless steel, high or low density polyethylene, polyethylene terephthalate, polystyrene or polypropylene for samples that are to be analyzed for parameters in analytical test groups MC1 and MC2 as set out in Schedule AA.

(8) Despite subsection (7), a direct discharger may use sampling devices that contain a short section of surgical grade silicone rubber tubing or other tubing approved by the Director if such tubing cannot be replaced by a material mentioned in subsection (7) without impairing the operation of the device.

(9) For the purposes of subsections 3(22), (25a) and (26) of the General Effluent Monitoring Regulation,

(a) a sample collected for analysis for parameters in more than one analytical test group as set out in the Schedules referred to in subsection (2) is deemed to be a sample collected for analysis for parameters in more than one analytical test group in Schedule 1 to the General Effluent Monitoring Regulation; and

(b) a laboratory sample container specified in Column 2 of Schedule CC to this Regulation is deemed to be a laboratory sample container specified in Column 2 of Schedule 2 to the General Effluent Monitoring Regulation.

(10) Instead of the minimum sample volumes specified in Column 5 of Schedule CC, a direct discharger may, in relation to a sample to be analyzed, submit to the laboratory performing the analysis the minimum sample volume required by the laboratory to meet the analytical method detection limits set out in Column 6 of Schedule DD.

(11) An obligation on a direct discharger to do a thing under this Regulation is discharged if another person has done it on the direct discharger's behalf.

(12) Each direct discharger shall collect each sample required to be collected from a process or combined effluent sampling point as a composite sample throughout an operating day in accordance with subsection 3(4) of the General Effluent Monitoring Regulation.

(13) For the purposes of this Regulation, a reference in the General Effluent Monitoring Regulation to a once-through cooling water effluent stream is deemed to be a reference to a cooling water effluent stream and a reference to a once-through cooling water sampling point is deemed to be a reference to a cooling water sampling point.

(14) Subsection 3(29) of the General Effluent Monitoring Regulation does not apply in relation to plants in respect of which the Table in subsection (2) indicates that storm event reporting is not required.

Sampling Points

4.-(1) Each direct discharger shall, by the 8th day of January, 1990, establish a sampling point on each effluent stream named in the site-specific monitoring schedule for that discharger's plant, as follows :

1. A combined effluent sampling point on each combined effluent stream.
2. A cooling water sampling point on each cooling water effluent stream.
3. A process effluent sampling point on each process effluent stream.
4. A storm water sampling point on each storm water effluent stream.

(2) Each direct discharger shall use the sampling points established under subsection (1) for all sampling required by this Regulation, except that a direct discharger may use alternate sampling points where that is acceptable to the Director.

(3) Except as otherwise specifically provided, sets of samples required to be collected under this Regulation need not be collected on the same day.

Characterization and Open Characterization

5.-(1) Each direct discharger shall collect a set of samples from the sampling point on each process effluent and combined effluent stream indicated as requiring characterization sampling in the site-specific monitoring schedule for that discharger's plant, at the characterization sampling frequencies and minimum intervals specified for that stream in that schedule, and shall perform a characterization and an open characterization on each such set.

(2) Each direct discharger shall collect a set of samples sufficient to perform the analyses required by subsection (3) from the sampling point on each process effluent and combined effluent stream indicated as requiring analytical test group 24 sampling in the site-specific monitoring schedule for that discharger's plant, at the frequencies and minimum intervals for analytical test group 24 sampling specified for that stream in that schedule.

(3) Each direct discharger shall analyze each set of samples collected under subsection (2) for the parameters in analytical test group 24, as indicated in the characterization parameters schedule for that discharger's plant.

(4) Each direct discharger shall collect a set of samples

from the sampling point on each cooling water effluent stream indicated as requiring characterization sampling in the site-specific monitoring schedule for that discharger's plant, at the characterization sampling frequencies and minimum intervals specified for that stream in that schedule, and shall perform a characterization on each such set.

(5) Each direct discharger shall collect a set of samples from the sampling point on each process effluent and combined effluent stream of that discharger that may have been adversely affected by any process change, within thirty days after each such change, and shall perform a characterization and open characterization on each such set.

(6) For the purposes of subsection 4(3) of the General Effluent Monitoring Regulation, samples collected under this section are collected for characterization.

(7) Each set of samples collected under this section shall be collected on an operating day.

Daily Monitoring

6.-(1) During each operating day, each direct discharger shall collect a set of samples sufficient to perform the analyses required by subsection (2) from each sampling point of that discharger.

(2) Each direct discharger shall analyze each set of samples collected under subsection (1) for the parameters indicated in the column marked "D", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(3) Subsection (1) does not apply in respect of any day on which a sufficient volume of sample cannot be collected because of the collection of inspection samples.

Thrice-Weekly Monitoring

7.-(1) On three operating days in each week, each direct discharger shall collect a set of samples sufficient to perform the analyses required by subsection (2) from each sampling point of that discharger.

(2) Each direct discharger shall analyze each set of samples collected under subsection (1) for the parameters indicated in the column marked "TW", for the stream from which the set was

collected, of the site-specific monitoring schedule for that discharger's plant.

Weekly Monitoring

8.-(1) On one operating day in each week, each direct discharger shall collect a set of samples sufficient to perform the analyses required by subsection (2) from each sampling point of that discharger.

(2) Each direct discharger shall analyze each set of samples collected under subsection (1) for the parameters indicated in the column marked "W", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(3) Each set of samples collected under subsection (1) shall be collected on one of the days on which a sample is collected under subsection 7(1) from the same sampling point, if a sample is collected from that sampling point under subsection 7(1) in the week.

(4) For the purposes of subsection (1), samples collected from a sampling point after the first sample is collected from that sampling point under subsection (1) shall be collected no sooner than two days after the previous sampling under subsection (1) from that sampling point.

Monthly Monitoring - Process Effluent and Combined Effluent

9.-(1) On one operating day in each month, each direct discharger shall collect a set of samples sufficient to perform the analyses required by subsection (2) from each process effluent and combined effluent sampling point of that discharger.

(2) Each direct discharger shall analyze each set of samples collected under subsection (1) for the parameters indicated in the column marked "M", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(3) Each set of samples collected under subsection (1) shall be collected on one of the days on which a sample is collected under subsection 8(1) from the same sampling point, if a sample is collected from that sampling point under subsection 8(1) in the month.

(4) Each set of samples collected under subsection (1) shall be collected on one of the days on which a sample is collected under subsection 7(1) from the same sampling point, if a sample is collected from that sampling point under subsection 7(1) in the month.

(5) For the purposes of subsection (1), samples collected from a sampling point after the first sample is collected from that sampling point under subsection (1) shall be collected no sooner than two weeks after the previous sampling under subsection (1) from that sampling point.

Cooling Water Monitoring

10.-(1) On one operating day in each month, each direct discharger shall collect a set of samples sufficient to perform the analyses required by subsection (2) from each cooling water effluent sampling point of that discharger.

(2) Each direct discharger shall analyze each set of samples collected under subsection (1) for the parameters indicated in the column marked "M", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(3) For the purposes of subsection (1), samples collected from a sampling point after the first sample is collected from that sampling point under subsection (1) shall be collected no sooner than two weeks after the previous sampling under subsection (1) from that sampling point.

(4) On one operating day in each quarter, each direct discharger shall collect a set of samples sufficient to perform the analysis required by subsection (5) from each cooling water sampling point of that discharger.

(5) Each direct discharger shall analyze each set of samples collected under subsection (4) for the parameters indicated in the column marked "Q", for the cooling water effluent stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(6) For the purposes of subsection (4), samples collected from a sampling point after the first sample is collected from that sampling point under subsection (4) shall be collected no sooner than sixty days after the previous sampling under subsection (4) from that sampling point

Storm Water Monitoring

11.-(1) On one operating day in each month in which there is a storm event or a thaw on an operating day, during a storm water discharge related to a storm event or thaw, each direct discharger shall collect a set of samples from each storm water sampling point of that discharger that is affected by the storm event or thaw, sufficient to perform all of the analyses required by subsection (2).

(2) Each direct discharger shall analyze each set of samples collected under subsection (1) for the parameters indicated in the column marked "M", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(3) Where a direct discharger has been unable to collect a set of samples from a storm water sampling point as required by subsection (1) because of insufficient flow, the discharger shall, on the earliest possible operating day, collect a compensating set of samples from that sampling point during a subsequent storm water discharge in respect of which the flow is sufficient and in respect of which a set of samples is not collected under subsection (1) and shall analyze the compensating set for the parameters referred to in subsection (2).

(4) The discharge of storm water referred to in subsection (3) shall be related to a storm event or thaw that affects the sampling point from which the compensating set of samples is collected.

Quality Control Monitoring

12-(1) Once in each month, on a day on which samples are collected under section 9 from the process effluent stream indicated as requiring quality control monitoring in the site-specific monitoring schedule for the direct discharger's plant, each direct discharger shall collect a duplicate sample for each sample collected on that day from that stream under sections 6 and 7.

(2) Each direct discharger shall analyze each set of duplicate samples collected under subsection (1) for samples collected under section 6 for the parameters indicated in the column marked "D" and each set of duplicate samples collected under subsection (1) for samples collected under section 7 for the parameters indicated in the column marked "TW", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(3) Quarterly, on a day on which samples are collected under subsection (1), each direct discharger shall collect a duplicate sample for each sample collected on that day under sections 8 and 9 from the process effluent stream indicated as requiring quality control monitoring in the site-specific monitoring schedule for that discharger's plant.

(4) Each direct discharger shall analyze each set of duplicate samples collected under subsection (3) for samples collected under section 8 for the parameters indicated in the column marked "W"and each set of duplicate samples collected under subsection (3) for samples collected under section 9 for the parameters indicated in the column marked "M", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(5) For the purposes of subsection (3), samples collected from a sampling point after the first sample is collected from that sampling point under subsection (3) shall be collected no sooner than sixty days after the previous sampling under subsection (3) from that sampling point.

(6) Semi-annually, on a day on which samples are collected under section 9 from the combined effluent stream indicated as requiring quality control monitoring in the site-specific monitoring schedule for the direct discharger's plant, each direct discharger shall collect a duplicate sample for each sample collected on that day from that stream under sections 8 and 9.

(7) Each direct discharger shall analyze each set of duplicate samples collected under subsection (6) for samples collected under section 8 for the parameters indicated in the column marked "W" and each set of duplicate samples collected under subsection (6) for samples collected under section 9 for the parameters indicated in the column marked "M", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(8) For the purposes of subsection (6), samples collected from a sampling point after the first sample is collected from that sampling point under subsection (5) shall be collected no sooner than 180 days after the previous sampling under subsection (5) from that sampling point.

(9) Once in each month, on the day on which samples are collected under subsection (1), each direct discharger shall prepare a travelling blank sample for each sample collected under sections 6 and 7 from the process effluent stream indicated as

requiring quality control monitoring in the site-specific monitoring schedule for that discharger's plant.

(10) Each direct discharger shall analyze each set of travelling blank samples prepared under subsection (9) for samples collected under section 6 for the parameters indicated in the column marked "D" and each set of travelling blank samples prepared under subsection (9) for samples collected under section 7 for the parameters indicated in the column marked "TW", for the stream from which the samples for which the travelling blank samples were prepared were collected, of the site-specific monitoring schedule for that discharger's plant.

(11) Quarterly, on the day on which samples are collected under subsection (3), each direct discharger shall prepare a travelling blank sample and a travelling spiked blank sample for each sample collected on that day under sections 8 and 9 from the process effluent stream indicated as requiring quality control monitoring in the site-specific monitoring schedule for that discharger's plant.

(12) Each direct discharger shall analyze each set of travelling blank samples prepared under subsection (11) for samples collected under section 8 for the parameters indicated in the column marked "W" and each set of travelling blank samples prepared under subsection (11) for samples collected under section 9 for the parameters indicated in the column marked "M", for the stream from which the samples for which the travelling blank samples were prepared were collected, of the site-specific monitoring schedule for that discharger's plant.

(13) Each direct discharger shall analyze each set of travelling spiked blank samples prepared under subsection (11) for samples collected under section 8 for the parameters in the column marked "W" and each set of travelling spiked blank samples prepared under subsection (11) for samples collected under section 9 for the parameters in analytical test groups 16 to 23 and 26 indicated in the column marked "M", for the stream from which the samples for which the travelling spiked blank samples were prepared were collected, of the site-specific monitoring schedule for that discharger's plant.

(14) Semi-annually, on the day on which samples are collected under subsection (6) each direct discharger shall prepare a travelling blank sample and a travelling spiked blank sample for each sample collected on that day under sections 8 and 9 from the combined effluent stream indicated as requiring quality control monitoring in the site-specific monitoring schedule for that discharger's plant.

(15) Each direct discharger shall analyze each set of travelling blank samples prepared under subsection (14) for samples collected under section 8 for the parameters indicated in the column marked "W" and each set of travelling blank samples prepared under subsection (14) for samples collected under section 9 for the parameters indicated in the column marked "M", for the stream from which the samples for which the travelling blank samples were prepared were collected, of the site-specific monitoring schedule for that discharger's plant.

(16) Each direct discharger shall analyze each set of travelling spiked blank samples prepared under subsection (14) for samples collected under section 8 and each set of travelling spiked blank samples prepared under subsection (14) for samples collected under section 9 for the parameters in analytical test groups 16 to 23 and 26 indicated in the characterization parameters schedule for that discharger's plant.

(17) Despite subsections (10), (12) and (15), a direct discharger need not analyze a travelling blank sample for the parameters in analytical test groups 1, 3 and 8 as indicated in the characterization parameters schedule for that discharger's plant.

Toxicity Testing

13.-(1) Each direct discharger shall collect a sample from the sampling point on each process effluent and combined effluent stream indicated in that discharger's site-specific monitoring schedule as requiring toxicity testing, at the toxicity testing frequencies and minimum intervals specified for that stream in that schedule, and shall perform a fish toxicity test and a Daphnia magna acute lethality toxicity test on each such sample.

(2) Each set of samples collected under subsection (1) shall be collected on one of the days on which a sample is collected under subsection 9(1) from the same sampling point.

(3) If the fish toxicity tests performed by a direct discharger under subsection (1) on all samples from a process effluent or a combined effluent sampling point in three consecutive months result in mortality for no more than two out of ten fish at all effluent concentrations, the discharger may thereafter perform the fish toxicity tests required by subsection (1), on the samples from that sampling point, on 100 per cent undiluted samples only.

(4) If a fish toxicity test performed under subsection (3) on any sample from a process effluent or a combined effluent

sampling point results in mortality for more than two out of ten fish, subsection (3) ceases to apply and continues not to apply to samples from that sampling point, until the fish toxicity tests performed under subsection (1) on all samples from that sampling point in a further three consecutive months result in mortality for no more than two out of ten fish at all effluent concentrations.

(5) Subsections (3) and (4) apply only with respect to sampling points on effluent streams in relation to which a site-specific monitoring schedule indicates that monthly toxicity testing is required.

(6) Each direct discharger shall collect a sample from the sampling point on the cooling water effluent stream indicated in that discharger's site-specific monitoring schedule as requiring toxicity testing, at the toxicity testing frequencies and minimum intervals specified for that stream in that schedule, and shall perform a fish toxicity test and a Daphnia magna acute lethality toxicity test on each such sample.

(7) Each set of samples collected under subsection (6) shall be collected on one of the days on which a sample is collected under subsection 10(1) from the same sampling point.

Flow Measurement

14.-(1) Each direct discharger shall continuously measure and record the flow of each process effluent stream and combined effluent stream of that discharger at a location or set of locations representative of the flow at the sampling point established for that stream.

(2) Where the flow of a process effluent stream or combined effluent stream cannot be continuously measured on any operating day because of equipment malfunction and all reasonable care has been taken to avoid and correct the malfunction, the direct discharger may fulfill the continuous flow measurement requirement of subsection (1) by estimating the total volume of effluent discharged on that day from that stream, and recording that estimate.

(3) Each direct discharger shall at the time of each sampling under this Regulation from a cooling water effluent stream of that discharger, measure or estimate the flow of that stream at a location or a set of locations representative of the flow at the sampling point established for that stream and shall record the measured or estimated data.

(4) Each direct discharger shall at the time of each sampling under this Regulation from a storm water effluent stream of that discharger, measure or estimate the flow of that stream at a location or a set of locations representative of the flow at the sampling point established for that stream and shall record the measured or estimated data.

(5) Subject to subsection (6), each direct discharger shall demonstrate by calibration, performed no earlier than 365 days before the filing of this Regulation and no later than thirty days before the first use of the device for the purposes of this Regulation, that each primary flow measuring device used to measure the flow of a process effluent stream for the purposes of this Regulation, meets the accuracy requirement of subsection 6(1) of the General Effluent Monitoring Regulation.

(6) Where a direct discharger demonstrates to the Director, by means of a certified report of a registered professional engineer of the Province of Ontario, that a primary flow measuring device has been designed and installed in accordance with standards of a national or international standards setting organization, that primary flow measuring device will be deemed to have met the accuracy requirement of subsection 6(1) of the General Effluent Monitoring Regulation.

(7) Subject to subsection (8), each direct discharger shall demonstrate by calibration, performed no earlier than 365 days before the filing of this Regulation and no later than thirty days before the first use of the device for the purposes of this Regulation, that each flow measuring device used to measure the flow of a combined effluent stream for the purposes of this Regulation, meets the accuracy requirement of subsection 6(3) of the General Effluent Monitoring Regulation.

(8) Where a direct discharger demonstrates to the Director, by means of a certified report of a registered professional engineer of the Province of Ontario, that a flow measurement device has been designed and installed in accordance with the standards of a national or international standards setting organization, that flow measurement device will be deemed to have met the accuracy requirement of subsection 6(3) of the General Effluent Monitoring Regulation.

Extended Weekly Monitoring

15.-(1) On one operating day in each week, each direct discharger shall collect a set of samples sufficient to perform all of the analyses required by subsection (2) from each process effluent and combined effluent sampling point of that discharger.

(2) Each direct discharger shall analyze each set of samples collected under subsection (1) for the parameters indicated in the columns marked "D", "TW" and "W", for the stream from which the set was collected, of the site-specific monitoring schedule for that discharger's plant.

(3) For the purposes of subsection (1), samples collected from a sampling point after the first sample is collected from that sampling point under subsection (1) shall be collected no sooner than two days after the previous sample under subsection (1) from that sampling point.

Reporting

16.-(1) Each direct discharger shall, by the 8th day of February, 1990 submit an initial report to the Director in respect of that discharger's plant.

(2) Each direct discharger shall ensure that the plans submitted under paragraph 1 of subsection 7(1) of the General Effluent Monitoring Regulation identify by type each effluent stream named in the site-specific monitoring schedule for that discharger's plant.

(3) Each direct discharger shall notify the Director in writing of any changes in respect of the information submitted under subsection (1), within thirty days after the end of the month during which the change occurs.

(4) Each direct discharger shall notify the Director in writing of any change of name or ownership of its plant occurring after the 27th day of September, 1989, within thirty days after this Regulation comes into force or within thirty days after any such change.

(5) Each direct discharger shall, no later than thirty days after the event, notify the Director in writing of any process change that occurs after this Regulation comes into force that may significantly affect the chemical composition of the effluent in any effluent stream named in the site-specific monitoring schedule for that discharger's plant.

(6) Each direct discharger shall, no later than thirty days before the event or thirty days after this Regulation comes into force, notify the Director in writing of any redirection of or change in the type of an effluent stream named in the site-specific monitoring schedule for that discharger's plant that occurs after the day this Regulation comes into force.

(7) For the purposes of subsections (2) and (6), effluent stream types are the types mentioned in subsection 4(1).

(8) Despite subsection (6), a direct discharger need not notify the Director of a redirection of an effluent stream to an emergency overflow effluent stream.

(9) Each direct discharger shall report to the Director the results of all analyses of samples performed by or on behalf of the discharger under sections 5 to 12 and 15 of this Regulation, including all positive numerical values at or above the analytical method detection limits calculated by the laboratory performing the analysis, together with the date on which each sample was collected and the method used to collect each sample.

(10) Each direct discharger shall, in accordance with subsection 7(6) of the General Effluent Monitoring Regulation, report to the Director the toxicity test information obtained under section 13, together with the date on which each sample was collected under section 13.

(11) The information required to be reported under subsection (10) constitutes results of analyses within the meaning of subsection 7(2) of the General Effluent Monitoring Regulation.

(12) Each direct discharger shall submit to the Director documentation of any calibration or certification of accuracy required by subsections 14(5) to (8) of this Regulation and subsection 6(2) of the General Effluent Monitoring Regulation, no later than thirty days before the first use of the device for the purposes of this Regulation.

(13) Each direct discharger shall, with respect to each method, device or calculation for flow measurement or estimation to be used in meeting the requirements of subsections 14(3) and (4), submit to the Director, no later than thirty days before the first use of the method, device or calculation for the purposes of this Regulation, documentation sufficient to satisfy the Director that the method, device or calculation complies with the accuracy requirements of subsection 6(6) of the General Effluent Monitoring Regulation.

(14) Each direct discharger shall submit to the Director documentation of each calibration performed under subsection 6(7) of the General Effluent Monitoring Regulation, within thirty days after the calibration was performed or within thirty days after this Regulation comes into force.

(15) Each direct discharger shall report to the Director the flow measurement information required to be recorded under subsections 14(1) to (4) in respect of each process effluent stream, combined effluent stream, cooling water effluent stream and storm water effluent stream of that discharger, together with the date on which each flow was measured.

(16) Each direct discharger shall submit to the Director a description of any methods, devices or calculations used in estimating the volume of a discharge of effluent under subsection 14(2), together with an assessment of the accuracy of those methods, devices or calculations, within sixty days after each such estimation.

(17) If the Table in subsection 3(2) indicates that storm event reporting is required in relation to a direct discharger's plant, the discharger shall report to the Director the date, approximate duration and amount of rainfall of each storm event in relation to that plant that occurs during the period beginning on the 1st day of May, 1990, and ending on the 30th day of April, 1991, within sixty days after each such storm event.

(18) Each direct discharger shall submit to the Director, at least thirty days before the collection of the first sample in each month under sections 5, 9 and 10, a schedule of intended sampling dates by sampling point location for all sampling to be done under those sections.

(19) Each direct discharger shall make every reasonable effort to follow the schedule submitted under subsection (18) but if the schedule cannot be followed as submitted, the discharger shall notify the Director promptly of any change in dates.

(20) Within thirty days after the end of each quarter, each direct discharger shall submit a report to the Director summarizing the quantities of chemicals added to each cooling water effluent stream of that discharger from which samples were collected under section 10 in the quarter, and stating the dates on which these additions occurred.

(21) Each direct discharger shall, no later than the 1st day of June, 1991, submit a report to the Director describing the variation in daily flow for the period beginning the 1st day of May, 1990 and ending the 30th day of April, 1991, of each process effluent stream from which samples are collected under this Regulation other than by means described in clauses 3(4)(a), (b) and (e) of the General Effluent Monitoring Regulation.

(22) The report referred to in subsection (21) shall include the raw data and calculation methods used to produce the report.

(23) Each direct discharger shall keep records of all sampling required by this Regulation, including, for each sample, the date of collection, the sampling procedures used, the amount of sample dilution by preservative if dilution exceeds 1 per cent, and any incident likely to affect an analytical result.

(24) Each direct discharger shall record the results of all maintenance and calibration performed on sampling equipment used in meeting the requirements of this Regulation.

(25) Each direct discharger shall keep records of all analytical methods used in meeting the requirements of this Regulation.

(26) Each direct discharger shall submit a report to the Director detailing the date, duration and cause of each sampling, toxicity testing, analytical and flow measurement malfunction or problem that interferes with fulfilling the requirements of this Regulation, together with a description of any remedial action taken, within sixty days after the day on which the malfunction or problem occurs.

(27) Each direct discharger shall keep all records and reports required by this Regulation to be kept or made for a period of two years following the date of the last report submitted to the Director under this section.

Commencement

17.-(1) This Regulation, except sections 5 to 13, subsections 14(1) to (4) and section 15 , comes into force on the day on which it is filed.

(2) Sections 5 to 13 and subsections 14(1) to (4) come into force on the 1st day of May, 1990.

(3) Section 15 comes into force on the 1st day of May, 1991.

Revocation

18.-(1) Sections 5 to 13 are revoked on the 1st day of May, 1991.

(2) Subsections 14(1) to (4) and section 15 are revoked on the 1st day of May, 1992.

LEGEND FOR SCHEDULES AA to DD and A to M

ATG - Analytical Test Group

D - Daily

TW - Thrice weekly

W - Weekly

M - Monthly

Q - Quarterly

SA - Semi-annually

SCHEDULE AA - CHARACTERIZATION PARAMETERS SCHEDULE

	COLUMN 1	COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP		PARAMETERS	CAS #s
#	NAME		
1	Chemical Oxygen Demand	Chemical oxygen demand (COD)	N/A
2	Total cyanide	Total cyanide	57-12-5
3	Hydrogen ion (pH)	Hydrogen ion (pH)	N/A
4a	Nitrogen	Ammonia plus Ammonium	N/A
		Total Kjeldahl nitrogen	N/A
4b		Nitrate + Nitrite	N/A
5a	Organic carbon	Dissolved organic carbon (DOC)	N/A
5b		Total organic carbon (TOC)	N/A
6	Total phosphorus	Total phosphorus	7723-14-0
7	Specific conductance	Specific conductance	N/A
8	Suspended solids	Total suspended solids (TSS)	N/A
		Volatile suspended solids (VSS)	N/A
9	Total metals	Aluminum	7429-90-5
		Beryllium	7440-41-7
		Cadmium	7440-43-9
		Chromium	7440-47-3
		Cobalt	7440-48-4
		Copper	7440-50-8
		Lead	7439-92-1
		Molybdenum	7439-98-7
		Nickel	7440-02-0
		Silver	7440-22-4
		Thallium	7440-28-0
		Vanadium	7440-62-2
		Zinc	7440-66-6
10	Hydrides	Antimony	7440-36-0
		Arsenic	7440-38-2
		Selenium	7782-49-2
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	7440-47-3
12	Mercury	Mercury	7439-97-6

SCHEDULE AA - CHARACTERIZATION PARAMETERS SCHEDULE

COLUMN 1		COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP		PARAMETERS	CAS #s
#	NAME		
13	Total alkyl lead (NOTE 2)	Tetra-ethyl lead	78-00-2
		Tri-ethyl lead	N/A
14	Phenolics (4AAP)	Phenolics (4AAP)	N/A
15	Sulphide	Sulphide	N/A
16	Volatiles, Halogenated	1,1,2,2-Tetrachloroethane	79-34-5
		1,1,2-Trichloroethane	79-00-5
		1,1-Dichloroethane	75-34-3
		1,1-Dichloroethylene	75-35-4
		1,2-Dichlorobenzene	95-50-1
		1,2-Dichloroethane (Ethylene dichloride)	107-06-2
		1,2-Dichloropropane	78-87-5
		1,3-Dichlorobenzene	541-73-1
		1,4-Dichlorobenzene	106-46-7
		Bromoform	75-25-2
		Bromomethane	74-83-9
		Carbon tetrachloride	56-23-5
		Chlorobenzene	108-90-7
		Chloroform	67-66-3
		Chloromethane	74-87-3
		Cis-1,3-Dichloropropylene	10061-01-5
		Dibromochloromethane	124-48-1
		Ethylene dibromide	106-93-4
		Methylene chloride	75-09-2
		Tetrachloroethylene (Perchloroethylene)	127-18-4
		Trans-1,2-Dichloroethylene	156-60-5
		Trans-1,3-Dichloropropylene	10061-02-6
		Trichloroethylene	79-01-6
		Trichlorofluoromethane	75-69-4
		Vinyl chloride (Chloroethylene)	75-01-4
17	Volatiles, Non-Halogenated	Benzene	71-43-2
		Styrene	100-42-5
		Toluene	108-88-3
		o-Xylene	95-47-6
		m-Xylene and p-Xylene	108-38-3
			& 106-42-3
18	Volatiles, Water Soluble	Acrolein	107-02-8
		Acrylonitrile	107-13-1

SCHEDULE AA - CHARACTERIZATION PARAMETERS SCHEDULE

	COLUMN 1	COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP #	NAME	PARAMETERS	CAS #s
19	Extractables, Base Neutral	Acenaphthene	83-32-9
		5-nitro Acenaphthene	602-87-9
		Acenaphthylene	208-96-8
		Anthracene	120-12-7
		Benz(a)anthracene	56-55-3
		Benzo(a)pyrene	50-32-8
		Benzo(b)fluoranthene	205-99-2
		Benzo(g,h,i)perylene	191-24-2
		Benzo(k)fluoranthene	207-08-9
		Biphenyl (NOTE 3)	92-52-4
		Camphene	79-92-5
		1-Chloronaphthalene	90-13-1
		2-Chloronaphthalene	91-58-7
		Chrysene	218-01-9
		Dibenz(a,h)anthracene	53-70-3
		Fluoranthene	206-44-0
		Fluorene	86-73-7
		Indeno(1,2,3-cd)pyrene	193-39-5
		Indole	120-72-9
		1-Methylnaphthalene	90-12-0
		2-Methylnaphthalene	91-57-6
		Naphthalene	91-20-3
		Perylene	198-55-0
		Phenanthrene	85-01-8
		Pyrene	129-00-0
		Benzyl butyl phthalate	85-68-7
		Bis(2-ethylhexyl) phthalate	117-81-7
		Di-n-butyl phthalate	84-74-2
		4-Bromophenyl phenyl ether	101-55-3
		4-Chlorophenyl phenyl ether	7005-72-3
		Bis(2-chloroisopropyl)ether	108-60-1
		Bis(2-chloroethyl)ether	111-44-4
		Diphenyl ether (NOTE 4)	10-184-8
		2,4-Dinitrotoluene	121-14-2
		2,6-Dinitrotoluene	606-20-2
		Bis(2-chloroethoxy)methane	111-91-1
		Diphenylamine	122-39-4
		N-Nitrosodiphenylamine	86-30-6
		N-Nitrosodi-n-propylamine	621-64-7

SCHEDULE AA - CHARACTERIZATION PARAMETERS SCHEDULE

COLUMN 1 ANALYTICAL TEST GROUP #	 NAME	COLUMN 2 PARAMETERS	COLUMN 3 CAS #s
20	Extractables, Acid (Phenolics)	2,3,4,5-Tetrachlorophenol	4901-51-3
		2,3,4,6-Tetrachlorophenol	58-90-2
		2,3,5,6-Tetrachlorophenol	935-95-5
		2,3,4-Trichlorophenol	15950-66-0
		2,3,5-Trichlorophenol	933-78-8
		2,4,5-Trichlorophenol	95-95-4
		2,4,6-Trichlorophenol	88-06-2
		2,4-Dimethyl phenol	105-67-9
		2,4-Dinitrophenol	51-28-5
		2,4-Dichlorophenol	120-83-2
		2,6-Dichlorophenol	87-65-0
		4,6-Dinitro-o-cresol	534-52-1
		2-Chlorophenol	95-57-8
		4-Chloro-3-methylphenol	59-50-7
		4-Nitrophenol	100-02-7
		m-Cresol	108-39-4
		o-Cresol	95-48-7
		p-Cresol	106-44-5
		Pentachlorophenol	87-86-5
		Phenol	108-95-2
23	Extractables, Neutral -Chlorinated	1,2,3,4-Tetrachlorobenzene	634-66-2
		1,2,3,5-Tetrachlorobenzene	634-90-2
		1,2,4,5-Tetrachlorobenzene	95-94-3
		1,2,3-Trichlorobenzene	87-61-6
		1,2,4-Trichlorobenzene	120-82-1
		2,4,5-Trichlorotoluene	6639-30-1
		Hexachlorobenzene	118-74-1
		Hexachlorobutadiene	87-68-3
		Hexachlorocyclopentadiene	77-47-4
		Hexachloroethane	67-72-1
		Octachlorostyrene	29082-74-4
		Pentachlorobenzene	608-93-5
24	Chlorinated Dibenzo-p-dioxins and Dibenzofurans	2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6
		Octachlorodibenzo-p-dioxin	326-88-7
		Octachlorodibenzofuran	Unavailable
		Total heptachlorinated dibenzo-p-dioxins	Unavailable
		Total heptachlorinated dibenzofurans	Unavailable
		Total hexachlorinated dibenzo-p-dioxins	34465-46-8
		Total hexachlorinated dibenzofurans	Unavailable
		Total pentachlorinated dibenzo-p-dioxins	Unavailable
		Total pentachlorinated dibenzofurans	Unavailable
		Total tetrachlorinated dibenzo-p-dioxins	Unavailable
		Total tetrachlorinated dibenzofurans	Unavailable

SCHEDULE AA - CHARACTERIZATION PARAMETERS SCHEDULE

COLUMN 1		COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP		PARAMETERS	CAS #s
#	NAME		
25	Solvent Extractables	Oil and grease	
26	Fatty and Resin Acids	Abietic acid	514-10-3
		Chlorodehydroabietic acid	61996-36-7
		Dehydroabietic acid	1740-19-8
		Isopimaric acid	5835-26-7
		Levopimaric acid	79-54-9
		Neoabietic acid	471-77-2
		Oleic acid	112-80-1
		Pimaric acid	127-27-5
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)	Unavailable
MC1	Metals	Iron	7439-89-6
		Magnesium	7439-95-4
MC2	Fluoride	Fluoride	N/A

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

NOTE 3: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Method Detection Limit of 0.6 micrograms per litre.

NOTE 4: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Method Detection Limit of 0.4 micrograms per litre.

SCHEDULE BB - CHARACTERIZATION PARAMETERS SCHEDULE

COLUMN 1		COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP #	NAME	PARAMETERS	CAS #s
1	Chemical Oxygen Demand	Chemical oxygen demand (COD)	N/A
2	Total cyanide	Total cyanide	57-12-5
3	Hydrogen ion (pH)	Hydrogen ion (pH)	N/A
4a	Nitrogen	Ammonia plus Ammonium	N/A
		Total Kjeldahl nitrogen	N/A
4b		Nitrate + Nitrite	N/A
5a	Organic carbon	Dissolved organic carbon (DOC)	N/A
5b		Total organic carbon (TOC)	N/A
6	Total phosphorus	Total phosphorus	7723-14-0
7	Specific conductance	Specific conductance	N/A
8	Suspended solids	Total suspended solids (TSS)	N/A
		Volatile suspended solids (VSS)	N/A
9	Total metals	Aluminum	7429-90-5
		Beryllium	7440-41-7
		Cadmium	7440-43-9
		Chromium	7440-47-3
		Cobalt	7440-48-4
		Copper	7440-50-8
		Lead	7439-92-1
		Molybdenum	7439-98-7
		Nickel	7440-02-0
		Silver	7440-22-4
		Thallium	7440-28-0
		Vanadium	7440-62-2
		Zinc	7440-66-6
10	Hydrides	Antimony	7440-36-0
		Arsenic	7440-38-2
		Selenium	7782-49-2
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	7440-47-3
12	Mercury	Mercury	7439-97-6

SCHEDULE BB - CHARACTERIZATION PARAMETERS SCHEDULE

COLUMN 1		COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP		PARAMETERS	CAS #s
#	NAME		
13	Total alkyl lead (NOTE 2)	Tetra-ethyl lead	78-00-2
		Tri-ethyl lead	N/A
14	Phenolics (4AAP)	Phenolics (4AAP)	N/A
15	Sulphide	Sulphide	N/A
16	Volatiles, Halogenated	1,1,2,2-Tetrachloroethane	79-34-5
		1,1,2-Trichloroethane	79-00-5
		1,1-Dichloroethane	75-34-3
		1,1-Dichloroethylene	75-35-4
		1,2-Dichlorobenzene	95-50-1
		1,2-Dichloroethane (Ethylene dichloride)	107-06-2
		1,2-Dichloropropane	78-87-5
		1,3-Dichlorobenzene	541-73-1
		1,4-Dichlorobenzene	106-46-7
		Bromoform	75-25-2
		Bromomethane	74-83-9
		Carbon tetrachloride	56-23-5
		Chlorobenzene	108-90-7
		Chloroform	67-66-3
		Chloromethane	74-87-3
		Cis-1,3-Dichloropropylene	10061-01-5
		Dibromochloromethane	124-48-1
		Ethylene dibromide	106-93-4
		Methylene chloride	75-09-2
		Tetrachloroethylene (Perchloroethylene)	127-18-4
		Trans-1,2-Dichloroethylene	156-60-5
		Trans-1,3-Dichloropropylene	10061-02-6
		Trichloroethylene	79-01-6
		Trichlorofluoromethane	75-69-4
		Vinyl chloride (Chloroethylene)	75-01-4
17	Volatiles, Non-Halogenated	Benzene	71-43-2
		Styrene	100-42-5
		Toluene	108-88-3
		o-Xylene	95-47-6
		m-Xylene and p-Xylene	108-38-3
			& 106-42-3
18	Volatiles, Water Soluble	Acrolein	107-02-8
		Acrylonitrile	107-13-1

SCHEDULE BB - CHARACTERIZATION PARAMETERS SCHEDULE

	COLUMN 1	COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP		PARAMETERS	CAS #s
#	NAME		
19	Extractables, Base Neutral	Acenaphthene	83-32-9
		5-nitro Acenaphthene	602-87-9
		Acenaphthylene	208-96-8
		Anthracene	120-12-7
		Benz(a)anthracene	56-55-3
		Benzo(a)pyrene	50-32-8
		Benzo(b)fluoranthene	205-99-2
		Benzo(g,h,i)perylene	191-24-2
		Benzo(k)fluoranthene	207-08-9
		Biphenyl (NOTE 3)	92-52-4
		Camphene	79-92-5
		1-Chloronaphthalene	90-13-1
		2-Chloronaphthalene	91-58-7
		Chrysene	218-01-9
		Dibenz(a,h)anthracene	53-70-3
		Fluoranthene	206-44-0
		Fluorene	86-73-7
		Indeno(1,2,3-cd)pyrene	193-39-5
		Indole	120-72-9
		1-Methylnaphthalene	90-12-0
		2-Methylnaphthalene	91-57-6
		Naphthalene	91-20-3
		Perylene	198-55-0
		Phenanthrene	85-01-8
		Pyrene	129-00-0
		Benzyl butyl phthalate	85-68-7
		Bis(2-ethylhexyl) phthalate	117-81-7
		Di-n-butyl phthalate	84-74-2
		4-Bromophenyl phenyl ether	101-55-3
		4-Chlorophenyl phenyl ether	7005-72-3
		Bis(2-chloroisopropyl)ether	108-60-1
		Bis(2-chloroethyl)ether	111-44-4
		Diphenyl ether (NOTE 4)	10-184-8
		2,4-Dinitrotoluene	121-14-2
		2,6-Dinitrotoluene	606-20-2
		Bis(2-chloroethoxy)methane	111-91-1
		Diphenylamine	122-39-4
		N-Nitrosodiphenylamine	86-30-6
		N-Nitrosodi-n-propylamine	621-64-7

SCHEDULE BB - CHARACTERIZATION PARAMETERS SCHEDULE

	COLUMN 1	COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP		PARAMETERS	CAS #s
#	NAME		
20	Extractables, Acid (Phenolics)	2,3,4,5-Tetrachlorophenol	4901-51-3
		2,3,4,6-Tetrachlorophenol	58-90-2
		2,3,5,6-Tetrachlorophenol	935-95-5
		2,3,4-Trichlorophenol	15950-66-0
		2,3,5-Trichlorophenol	933-78-8
		2,4,5-Trichlorophenol	95-95-4
		2,4,6-Trichlorophenol	88-06-2
		2,4-Dimethyl phenol	105-67-9
		2,4-Dinitrophenol	51-28-5
		2,4-Dichlorophenol	120-83-2
		2,6-Dichlorophenol	87-65-0
		4,6-Dinitro-o-cresol	534-52-1
		2-Chlorophenol	95-57-8
		4-Chloro-3-methylphenol	59-50-7
		4-Nitrophenol	100-02-7
		m-Cresol	108-39-4
		o-Cresol	95-48-7
		p-Cresol	106-44-5
		Pentachlorophenol	87-86-5
		Phenol	108-95-2
25	Solvent Extractables	Oil and grease	
26	Fatty and Resin Acids	Abietic acid	514-10-3
		Chlorodehydroabietic acid	61996-36-7
		Dehydroabietic acid	1740-19-8
		Isopimaric acid	5835-26-7
		Levopimaric acid	79-54-9
		Neoabietic acid	471-77-2
		Oleic acid	112-80-1
		Pimaric acid	127-27-5
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)	Unavailable

SCHEDULE BB - CHARACTERIZATION PARAMETERS SCHEDULE

COLUMN 1		COLUMN 2	COLUMN 3
ANALYTICAL TEST GROUP		PARAMETERS	CAS #s
#	NAME		
MC1	Metals	Iron	7439-89-6
		Magnesium	7439-95-4
MC2	Fluoride	Fluoride	N/A

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

NOTE 3: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Method Detection Limit of 0.6 micrograms per litre.

NOTE 4: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Method Detection Limit of 0.4 micrograms per litre.

SCHEDULE CC - SAMPLING PRINCIPLES

Column 1 ANALYTICAL TEST GROUP	Column 2 LABORATORY SAMPLE CONTAINER	Column 3 LABORATORY CONTAINER PRE-TREATMENT	Column 4 TEST SPECIFIC SAMPLING PRECAUTIONS	Col. 5 MIN. SAM. VOL	Column 6 PRESERVATION METHOD	Column 7 MAX. STORAGE TIME (DAYS)
Fatty and	**Resin Acids**					
26	Amber glass or fluorocarbon resin with fluorocarbon resin lined cap.	If pre-treatment necessary: Bottle: Sequence of extensive washing/hot water, detergent, water, distilled water. Bake at 300° C for 8 h minimum or 3 rinses with pesticide grade or distilled in glass hexane and dichloromethane. Cap: no pre-treatment.	Contact surfaces must be glass, fluorocarbon resin or stainless steel.	800mL	None	7
Metals						
MC1	Sample containers and caps/ liners must be composed only of one or more of the following materials: fluorocarbon resin, polyethylene terephthalate, glass, polystyrene, polypropylene, high or low density polyethylene. Metallic foil should not be used.	If pre-treatment necessary, soak overnight in a 5% solution of nitric acid (HNO3), followed by several rinses in distilled water.	If sample is high (>5%) in hydrocarbons or organic solvents, use glass or fluorocarbon resin sample container only.	100mL	Add nitric acid (HNO3) (containing <1 mg/L of all analytes) to lower pH to <2.	30

SCHEDULE CC - SAMPLING PRINCIPLES

Column 1	Column 2	Column 3	Column 4	Col. 5	Column 6	Column 7
ANALYTICAL TEST GROUP	LABORATORY SAMPLE CONTAINER	LABORATORY CONTAINER PRE-TREATMENT	TEST SPECIFIC SAMPLING PRECAUTIONS	MIN. SAM. VOL.	PRESERVATION METHOD	MAX. STORAGE TIME (DAYS)
Fluoride MC2	Sample containers and caps/liners must be composed only of one or more of the following materials: fluorocarbon resin, polyethylene terephthalate, glass, polystyrene, polypropylene, high or low density polyethylene. Metallic foil should not be used.	Generally no pre-treatment required for new containers.	If sample is high (>5%) in hydrocarbons or organic solvents, use glass or fluorocarbon resin sample container only.	50 mL	None	28

SCHEDULE DD - ANALYTICAL PRINCIPLES & ANALYTICAL METHOD DETECTION LIMITS

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
ANALYTICAL TEST GROUP #	PARAMETERS CONVENTIONAL AND METAL PARAMETERS	SAMPLE PREPARATION METHOD PRINCIPLES	INSTRUMENTAL MEASUREMENT METHOD PRINCIPLES	ALTERNATE INSTRUMENTAL MEASUREMENT METHOD PRINCIPLES	ANALYTICAL METHOD DETECTION LIMITS
26	Abietic acid	pH adjusted to 9 Liquid/liquid extraction with methyl t-butyl ether methylation with diazomethane	Gas Chromatography/ Flame Ionization Detection Capillary column	N/A	0.005
	Chlorodehydroabietic acid				0.005
	Dehydroabietic acid				0.005
	Isopimaric acid				0.005
	Levopimaric acid				0.005
	Neoabietic acid				0.005
	Oleic acid				0.005
	Pimaric acid				0.005
MC1	Iron	Nitric evaporation or aqua regia digestion	Atomic absorption spectrometry and/or Emission Spectrometry - Inductively Coupled Plasma (ICP) or Direct Current Argon Plasma Spectrometry (DCP)	Polarography via the method of standard addition in the presence of suitable electrolyte	0.02 mg/L
	Magnesium				
MC2	Fluoride	Preparation for measurement system as appropriate	Colourimetry or Specific Ion Electrode	N/A	0.1 mg/L

SCHEDULE A: ACUSTAR CANADA INC. - ETOBICOKE

NAME OF EFFLUENT STREAM:	Storm Sewer
EFFLUENT STREAM TYPE:	Cooling Water
CHARACTERIZATION SAMPLING REQUIRED:	No
CHARACTERIZATION SAMPLING FREQUENCY:	None
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
ATG 24 SAMPLING REQUIRED:	No
ATG 24 SAMPLING FREQUENCY:	None
ATG 24 SAMPLING MINIMUM INTERVAL:	
OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
TOXICITY TESTING REQUIRED:	Yes
TOXICITY TESTING FREQUENCY:	Semi-annually
TOXICITY TESTING MINIMUM INTERVAL:	180 days
QUALITY CONTROL MONITORING REQUIRED:	No
FREQUENCY OF SAMPLING:	M

ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X
5a	Organic carbon	Dissolved organic carbon (DOC)	X
5b	Organic carbon	Total organic carbon (TOC)	
8	Suspended solids	Total suspended solids (TSS)	X
		Volatile suspended solids (VSS)	
9	Total metals	Aluminum	X
		Beryllium	X
		Cadmium	X
		Chromium	X
		Cobalt	X
		Copper	X
		Lead	X
		Molybdenum	X
		Nickel	X
		Silver	X

SCHEDULE A: ACUSTAR CANADA INC. - ETOBICOKE

		NAME OF EFFLUENT STREAM:	Storm Sewer
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	No
		CHARACTERIZATION SAMPLING FREQUENCY: CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	None
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY: ATG 24 SAMPLING MINIMUM INTERVAL:	None
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY: OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	None
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY: TOXICITY TESTING MINIMUM INTERVAL:	Semi-annually 180 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
9	Total metals (continued)	Thallium	X
		Vanadium	X
		Zinc	X
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	X
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead	X
		Tri-alkyl lead	X
25	Solvent Extractables	Oil and grease	X
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)	X

SCHEDULE A: ACUSTAR CANADA INC. - ETOBICOKE

NAME OF EFFLUENT STREAM:			Storm Sewer
EFFLUENT STREAM TYPE:			Cooling Water
CHARACTERIZATION SAMPLING REQUIRED:			No
CHARACTERIZATION SAMPLING FREQUENCY:			None
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			
ATG 24 SAMPLING REQUIRED:			No
ATG 24 SAMPLING FREQUENCY:			None
ATG 24 SAMPLING MINIMUM INTERVAL:			
OPEN CHARACTERIZATION SAMPLING REQUIRED:			No
OPEN CHARACTERIZATION SAMPLING FREQUENCY:			None
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			
TOXICITY TESTING REQUIRED:			Yes
TOXICITY TESTING FREQUENCY:			Semi-annually
TOXICITY TESTING MINIMUM INTERVAL:			180 days
QUALITY CONTROL MONITORING REQUIRED:			No
FREQUENCY OF SAMPLING:			M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
MC1	Metals	Iron	X
		Magnesium	X
MC2	Fluoride	Fluoride	X

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE B: The BOWMANVILLE FOUNDRY CO. LTD. - BOWMANVILLE

NAME OF EFFLUENT STREAM:	Furnace Cooling System	
EFFLUENT STREAM TYPE:	Cooling Water	
CHARACTERIZATION SAMPLING REQUIRED:	No	
CHARACTERIZATION SAMPLING FREQUENCY: CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	None	
ATG 24 SAMPLING REQUIRED:	No	
ATG 24 SAMPLING FREQUENCY: ATG 24 SAMPLING MINIMUM INTERVAL:	None	
OPEN CHARACTERIZATION SAMPLING REQUIRED:	No	
OPEN CHARACTERIZATION SAMPLING FREQUENCY: OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	None	
TOXICITY TESTING REQUIRED:	Yes	
TOXICITY TESTING FREQUENCY: TOXICITY TESTING MINIMUM INTERVAL:	Semi-annually 180 days	
QUALITY CONTROL MONITORING REQUIRED:	No	
FREQUENCY OF SAMPLING:	M	Q

ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	M	Q
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X	
5a	Organic carbon	Dissolved organic carbon (DOC)	X	
5b		Total organic carbon (TOC)		
6	Suspended solids	Total suspended solids (TSS)	X	
		Volatile suspended solids (VSS)		
9	Total metals	Aluminum	X	
		Beryllium	X	
		Cadmium	X	
		Chromium	X	
		Cobalt	X	
		Copper	X	
		Lead	X	
		Molybdenum	X	
		Nickel	X	
		Silver	X	

SCHEDULE B: The BOWMANVILLE FOUNDRY CO. LTD. - BOWMANVILLE

		NAME OF EFFLUENT STREAM:	Furnace Cooling System	
		EFFLUENT STREAM TYPE:	Cooling Water	
		CHARACTERIZATION SAMPLING REQUIRED:	No	
		CHARACTERIZATION SAMPLING FREQUENCY:	None	
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:		
		ATG 24 SAMPLING REQUIRED:	No	
		ATG 24 SAMPLING FREQUENCY:	None	
		ATG 24 SAMPLING MINIMUM INTERVAL:		
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No	
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None	
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:		
		TOXICITY TESTING REQUIRED:	Yes	
		TOXICITY TESTING FREQUENCY:	Semi-annually	
		TOXICITY TESTING MINIMUM INTERVAL:	180 days	
		QUALITY CONTROL MONITORING REQUIRED:	No	
		FREQUENCY OF SAMPLING:	M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED		
9	Total metals (continued)	Thallium	X	
		Vanadium	X	
		Zinc	X	
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	X	
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead	X	
		Tri-alkyl lead	X	
14	Phenolics (4AAP)	Phenolics (4AAP)	X	
25	Solvent Extractables	Oil and grease	X	
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)		X

SCHEDULE B: The BOWMANVILLE FOUNDRY CO. LTD. - BOWMANVILLE

NAME OF EFFLUENT STREAM:			Furnace Cooling System	
EFFLUENT STREAM TYPE:			Cooling Water	
CHARACTERIZATION SAMPLING REQUIRED:			No	
CHARACTERIZATION SAMPLING FREQUENCY:			None	
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:				
ATG 24 SAMPLING REQUIRED:			No	
ATG 24 SAMPLING FREQUENCY:			None	
ATG 24 SAMPLING MINIMUM INTERVAL:				
OPEN CHARACTERIZATION SAMPLING REQUIRED:			No	
OPEN CHARACTERIZATION SAMPLING FREQUENCY:			None	
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:				
TOXICITY TESTING REQUIRED:			Yes	
TOXICITY TESTING FREQUENCY:			Semi-annually	
TOXICITY TESTING MINIMUM INTERVAL:			180 days	
QUALITY CONTROL MONITORING REQUIRED:			No	
FREQUENCY OF SAMPLING:			M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED		
MC1	Metals	Iron	X	
		Magnesium	X	

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE C: CANADA ALLOY CASTINGS LTD. - KITCHENER

NAME OF EFFLUENT STREAM:			Storm Sewer
EFFLUENT STREAM TYPE:			Cooling Water
CHARACTERIZATION SAMPLING REQUIRED:			No
CHARACTERIZATION SAMPLING FREQUENCY:			None
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			
ATG 24 SAMPLING REQUIRED:			No
ATG 24 SAMPLING FREQUENCY:			None
ATG 24 SAMPLING MINIMUM INTERVAL:			
OPEN CHARACTERIZATION SAMPLING REQUIRED:			No
OPEN CHARACTERIZATION SAMPLING FREQUENCY:			None
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			
TOXICITY TESTING REQUIRED:			Yes
TOXICITY TESTING FREQUENCY:			Semi-annually
TOXICITY TESTING MINIMUM INTERVAL:			180 days
QUALITY CONTROL MONITORING REQUIRED:			No
FREQUENCY OF SAMPLING:			M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X
5a	Organic carbon	Dissolved organic carbon (DOC)	X
5b		Total organic carbon (TOC)	
8	Suspended solids	Total suspended solids (TSS)	X
		Volatile suspended solids (VSS)	
9	Total metals	Aluminum	X
		Beryllium	X
		Cadmium	X
		Chromium	X
		Cobalt	X
		Copper	X
		Lead	X
		Molybdenum	X
		Nickel	X
		Silver	X

SCHEDULE C: CANADA ALLOY CASTINGS LTD. - KITCHENER

		NAME OF EFFLUENT STREAM:	Storm Sewer
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	No
		CHARACTERIZATION SAMPLING FREQUENCY:	None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Semi-annually
		TOXICITY TESTING MINIMUM INTERVAL:	180 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
9	Total metals (continued)	Thallium	X
		Vanadium	X
		Zinc	X
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	X
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead	X
		Tri-alkyl lead	X
14	Phenolics (4AAP)	Phenolics (4AAP)	X
25	Solvent Extractables	Oil and grease	X

SCHEDULE C: CANADA ALLOY CASTINGS LTD. - KITCHENER

		NAME OF EFFLUENT STREAM:	Storm Sewer
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	No
		CHARACTERIZATION SAMPLING FREQUENCY:	None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Semi-annually
		TOXICITY TESTING MINIMUM INTERVAL:	180 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
MC1	Metals	Iron	X
		Magnesium	X
MC2	Fluoride	Fluoride	X

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE D: CANADA PIPE COMPANY LTD. - HAMILTON

NAME OF EFFLUENT STREAM:			Cupola Scrubber Sump Pit			Cement Lining Sump Pit		Main Floor Drain Sump Pit		Accubar	
EFFLUENT STREAM TYPE:			Combined			Cooling Water		Cooling Water		Cooling Water	
CHARACTERIZATION SAMPLING REQUIRED:			Yes			No		No		No	
CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly			None		None		None	
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days								
ATG 24 SAMPLING REQUIRED:			No			No		No		No	
ATG 24 SAMPLING FREQUENCY:			None			None		None		None	
ATG 24 SAMPLING MINIMUM INTERVAL:											
OPEN CHARACTERIZATION SAMPLING REQUIRED:			Yes			No		No		No	
OPEN CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly			None		None		None	
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days								
TOXICITY TESTING REQUIRED:			Yes			No		No		No	
TOXICITY TESTING FREQUENCY:			Quarterly			None		None		None	
TOXICITY TESTING MINIMUM INTERVAL:			60 days								
QUALITY CONTROL MONITORING REQUIRED:			Yes			No		No		No	
FREQUENCY OF SAMPLING:			W	M	Q	M	Q	M	Q	M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED									
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X			X		X		X	
5a	Organic carbon	Dissolved organic carbon (DOC)		X		X		X		X	
5b		Total organic carbon (TOC)									
8	Suspended solids	Total suspended solids (TSS)	X			X		X		X	
		Volatile suspended solids (VSS)									
9	Total metals	Aluminum		X		X		X		X	
		Beryllium		X		X		X		X	
		Cadmium		X		X		X		X	
		Chromium		X		X		X		X	
		Cobalt		X		X		X		X	
		Copper		X		X		X		X	
		Lead		X		X		X		X	
		Molybdenum		X		X		X		X	
		Nickel		X		X		X		X	

SCHEDULE D: CANADA PIPE COMPANY LTD. - HAMILTON

		NAME OF EFFLUENT STREAM:	Cupola Scrubber Sump Pit			Cement Lining Sump Pit		Main Floor Drain Sump Pit		Accubar	
		EFFLUENT STREAM TYPE:	Combined			Cooling Water		Cooling Water		Cooling Water	
		CHARACTERIZATION SAMPLING REQUIRED:	Yes			No		No		No	
		CHARACTERIZATION SAMPLING FREQUENCY: CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	Quarterly 60 days			None		None		None	
		ATG 24 SAMPLING REQUIRED:	No			No		No		No	
		ATG 24 SAMPLING FREQUENCY: ATG 24 SAMPLING MINIMUM INTERVAL:	None			None		None		None	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes			No		No		No	
		OPEN CHARACTERIZATION SAMPLING FREQUENCY: OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	Quarterly 60 days			None		None		None	
		TOXICITY TESTING REQUIRED:	Yes			No		No		No	
		TOXICITY TESTING FREQUENCY: TOXICITY TESTING MINIMUM INTERVAL:	Quarterly 60 days			None		None		None	
		QUALITY CONTROL MONITORING REQUIRED:	Yes			No		No		No	
		FREQUENCY OF SAMPLING:	W	M	Q	M	Q	M	Q	M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED									
9	Total metals (continued)	Silver		X		X		X		X	
		Thallium		X		X		X		X	
		Vanadium		X		X		X		X	
		Zinc		X		X		X		X	
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)		X		X		X		X	
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead		X		X		X		X	
		Tri-alkyl lead		X		X		X		X	
14	Phenolics (4AAP)	Phenolics (4AAP)	X			X		X			
25	Solvent Extractables	Oil and grease	X			X		X		X	
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)					X		X		

SCHEDULE D: CANADA PIPE COMPANY LTD. - HAMILTON

NAME OF EFFLUENT STREAM:			Cupola Scrubber Sump Pit			Cement Lining Sump Pit		Main Floor Drain Sump Pit		Accubar	
EFFLUENT STREAM TYPE:			Combined			Cooling Water		Cooling Water		Cooling Water	
CHARACTERIZATION SAMPLING REQUIRED:			Yes			No		No		No	
CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly			None		None		None	
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days								
ATG 24 SAMPLING REQUIRED:			No			No		No		No	
ATG 24 SAMPLING FREQUENCY:			None			None		None		None	
ATG 24 SAMPLING MINIMUM INTERVAL:											
OPEN CHARACTERIZATION SAMPLING REQUIRED:			Yes			No		No		No	
OPEN CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly			None		None		None	
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days								
TOXICITY TESTING REQUIRED:			Yes			No		No		No	
TOXICITY TESTING FREQUENCY:			Quarterly			None		None		None	
TOXICITY TESTING MINIMUM INTERVAL:			60 days								
QUALITY CONTROL MONITORING REQUIRED:			Yes			No		No		No	
FREQUENCY OF SAMPLING:			W	M	Q	M	Q	M	Q	M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED									
MC1	Metals	Iron		X		X		X		X	
		Magnesium		X		X		X		X	
MC2	Fluoride	Fluoride		X							

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE E: CROWE FOUNDRY LTD. - CAMBRIDGE

NAME OF EFFLUENT STREAM:	Storm Sewer
EFFLUENT STREAM TYPE:	Combined
CHARACTERIZATION SAMPLING REQUIRED:	Yes
CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
ATG 24 SAMPLING REQUIRED:	No
ATG 24 SAMPLING FREQUENCY:	None
ATG 24 SAMPLING MINIMUM INTERVAL:	
OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes
OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
TOXICITY TESTING REQUIRED:	Yes
TOXICITY TESTING FREQUENCY:	Quarterly
TOXICITY TESTING MINIMUM INTERVAL:	60 days
QUALITY CONTROL MONITORING REQUIRED:	Yes

		FREQUENCY OF SAMPLING:			
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	W	M	Q
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X		
5a	Organic carbon	Dissolved organic carbon (DOC)		X	
5b		Total organic carbon (TOC)		X	
8	Suspended solids	Total suspended solids (TSS)	X		
		Volatile suspended solids (VSS)	X		
9	Total metals	Aluminum		X	
		Beryllium		X	
		Cadmium		X	
		Chromium		X	
		Cobalt		X	
		Copper		X	
		Lead		X	
		Molybdenum		X	
		Nickel		X	
		Silver		X	

SCHEDULE E: CROWE FOUNDRY LTD. - CAMBRIDGE

NAME OF EFFLUENT STREAM:	Storm Sewer
EFFLUENT STREAM TYPE:	Combined
CHARACTERIZATION SAMPLING REQUIRED:	Yes
CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
ATG 24 SAMPLING REQUIRED:	No
ATG 24 SAMPLING FREQUENCY:	None
ATG 24 SAMPLING MINIMUM INTERVAL:	
OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes
OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
TOXICITY TESTING REQUIRED:	Yes
TOXICITY TESTING FREQUENCY:	Quarterly
TOXICITY TESTING MINIMUM INTERVAL:	60 days
QUALITY CONTROL MONITORING REQUIRED:	Yes

ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	FREQUENCY OF SAMPLING: W	M	Q
9	Total metals (continued)	Thallium		X	
		Vanadium		X	
		Zinc		X	
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)		X	
12	Mercury	Mercury		X	
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead		X	
		Tri-alkyl lead		X	
14	Phenolics (4AAP)	Phenolics (4AAP)	X		
25	Solvent Extractables	Oil and grease	X		
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)			X

SCHEDULE E: CROWE FOUNDRY LTD. - CAMBRIDGE

NAME OF EFFLUENT STREAM:	Storm Sewer
EFFLUENT STREAM TYPE:	Combined
CHARACTERIZATION SAMPLING REQUIRED:	Yes
CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
ATG 24 SAMPLING REQUIRED:	No
ATG 24 SAMPLING FREQUENCY:	None
ATG 24 SAMPLING MINIMUM INTERVAL:	
OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes
OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
TOXICITY TESTING REQUIRED:	Yes
TOXICITY TESTING FREQUENCY:	Quarterly
TOXICITY TESTING MINIMUM INTERVAL:	60 days
QUALITY CONTROL MONITORING REQUIRED:	Yes

			FREQUENCY OF SAMPLING:		
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	W	M	Q
MC1	Metals	Iron		X	
		Magnesium		X	
MC2	Fluoride	Fluoride		X	

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE F: FAHRAMET DIVISION OF INDUSMIN - ORILLIA

		NAME OF EFFLUENT STREAM:	Cooling Pond Overflow
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	Yes
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Quarterly
		TOXICITY TESTING MINIMUM INTERVAL:	60 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X
5a	Organic carbon	Dissolved organic carbon (DOC)	X
5b		Total organic carbon (TOC)	
8	Suspended solids	Total suspended solids (TSS)	X
		Volatile suspended solids (VSS)	
9	Total metals	Aluminum	X
		Beryllium	X
		Cadmium	X
		Chromium	X
		Cobalt	X
		Copper	X
		Lead	X
		Molybdenum	X
		Nickel	X
		Silver	X

SCHEDULE F: FAHRAMET DIVISION OF INDUSMIN - ORILLIA

		NAME OF EFFLUENT STREAM:	Cooling Pond Overflow
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	Yes
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Quarterly
		TOXICITY TESTING MINIMUM INTERVAL:	60 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
9	Total metals (continued)	Thallium	X
		Vanadium	X
		Zinc	X
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	X
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead	X
		Tri-alkyl lead	X
14	Phenolics (4AAP)	Phenolics (4AAP)	X
25	Solvent Extractables	Oil and grease	X
MC1	Metals	Iron	X
		Magnesium	X
MC2	Fluoride	Fluoride	X

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined			
		EFFLUENT STREAM TYPE:	Process				Combined			
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		ATG 24 SAMPLING REQUIRED:	Yes				Yes			
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually			
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days			
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		TOXICITY TESTING REQUIRED:	No				Yes			
		TOXICITY TESTING FREQUENCY:	None				Monthly			
		TOXICITY TESTING MINIMUM INTERVAL:					15 days			
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No			
		FREQUENCY OF SAMPLING:	D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
1	Chemical Oxygen Demand	Chemical oxygen demand (COD)		X				X		
2	Total cyanide	Total cyanide				X				X
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X				X			
4a	Nitrogen	Ammonia plus Ammonium				X				X
		Total Kjeldahl nitrogen								
4b	Nitrogen	Nitrate + Nitrite				X				X
5a	Organic carbon	Dissolved organic carbon (DOC)			X				X	
5b	Organic carbon	Total organic carbon (TOC)								
6	Total phosphorus	Total phosphorus			X				X	
7	Specific conductance	Specific conductance	X				X			

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

NAME OF EFFLUENT STREAM:			Foundry Process				Foundry Combined			
EFFLUENT STREAM TYPE:			Process				Combined			
CHARACTERIZATION SAMPLING REQUIRED:			Yes				Yes			
CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly				Quarterly			
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days				60 days			
ATG 24 SAMPLING REQUIRED:			Yes				Yes			
ATG 24 SAMPLING FREQUENCY:			Semi-annually				Semi-annually			
ATG 24 SAMPLING MINIMUM INTERVAL:			180 days				180 days			
OPEN CHARACTERIZATION SAMPLING REQUIRED:			Yes				Yes			
OPEN CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly				Quarterly			
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days				60 days			
TOXICITY TESTING REQUIRED:			No				Yes			
TOXICITY TESTING FREQUENCY:			None				Monthly			
TOXICITY TESTING MINIMUM INTERVAL:							15 days			
QUALITY CONTROL MONITORING REQUIRED:			Yes				No			
FREQUENCY OF SAMPLING:			D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
8	Suspended solids	Total suspended solids (TSS)	X				X			
		Volatile suspended solids (VSS)								
9	Total metals	Aluminum		X				X		
		Beryllium		X				X		
		Cadmium		X				X		
		Chromium		X				X		
		Cobalt		X				X		
		Copper		X				X		
		Lead		X				X		
		Molybdenum		X				X		
		Nickel		X				X		
		Silver		X				X		
		Thallium		X				X		
		Vanadium		X				X		
		Zinc		X				X		
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)		X				X		

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined			
		EFFLUENT STREAM TYPE:	Process				Combined			
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		ATG 24 SAMPLING REQUIRED:	Yes				Yes			
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually			
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days			
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		TOXICITY TESTING REQUIRED:	No				Yes			
		TOXICITY TESTING FREQUENCY:	None				Monthly			
		TOXICITY TESTING MINIMUM INTERVAL:					15 days			
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No			
		FREQUENCY OF SAMPLING:	D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
12	Mercury	Mercury				X				X
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead				X				X
		Tri-alkyl lead				X				X
14	Phenolics (4AAP)	Phenolics (4AAP)	X				X			
15	Sulphide	Sulphide				X				X
16	Volatiles, Halogenated	1,1,2,2-Tetrachloroethane				X				X
		1,1,2-Trichloroethane				X				X
		1,1-Dichloroethane				X				X
		1,1-Dichloroethylene				X				X
		1,2-Dichlorobenzene				X				X
		1,2-Dichloroethane (Ethylene dichloride)				X				X
		1,2-Dichloropropane				X				X
		1,3-Dichlorobenzene				X				X
		1,4-Dichlorobenzene				X				X
		Bromoform				X				X

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined			
		EFFLUENT STREAM TYPE:	Process				Combined			
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		ATG 24 SAMPLING REQUIRED:	Yes				Yes			
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually			
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days			
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		TOXICITY TESTING REQUIRED:	No				Yes			
		TOXICITY TESTING FREQUENCY:	None				Monthly			
		TOXICITY TESTING MINIMUM INTERVAL:					15 days			
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No			
		FREQUENCY OF SAMPLING:	D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
16	Volatiles, Halogenated (continued)	Bromomethane				X				X
		Carbon tetrachloride				X				X
		Chlorobenzene				X				X
		Chloroform				X				X
		Chloromethane				X				X
		Cis-1,3-Dichloropropylene				X				X
		Dibromochloromethane				X				X
		Ethylene dibromide				X				X
		Methylene chloride				X				X
		Tetrachloroethylene (Perchloroethylene)				X				X
		Trans-1,2-Dichloroethylene				X				X
		Trans-1,3-Dichloropropylene				X				X
		Trichloroethylene				X				X
		Trichlorofluoromethane				X				X
		Vinyl chloride (Chloroethylene)				X				X

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined			
		EFFLUENT STREAM TYPE:	Process				Combined			
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		ATG 24 SAMPLING REQUIRED:	Yes				Yes			
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually			
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days			
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		TOXICITY TESTING REQUIRED:	No				Yes			
		TOXICITY TESTING FREQUENCY:	None				Monthly			
		TOXICITY TESTING MINIMUM INTERVAL:					15 days			
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No			
		FREQUENCY OF SAMPLING:	D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
17	Volatiles, Non-Halogenated	Benzene				X				X
		Styrene				X				X
		Toluene				X				X
		o-Xylene				X				X
		m-Xylene and p-Xylene				X				X
18	Volatiles, Water Soluble	Acrolein				X				X
		Acrylonitrile				X				X
19	Extractables, Base Neutral	Acenaphthene				X				X
		5-nitro Acenaphthene				X				X
		Acenaphthylene				X				X
		Anthracene				X				X
		Benz(a)anthracene				X				X
		Benzo(a)pyrene				X				X
		Benzo(b)fluoranthene				X				X
		Benzo(g,h,i)perylene				X				X
		Benzo(k)fluoranthene				X				X
		Biphenyl (NOTE 3)				X				X

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined			
		EFFLUENT STREAM TYPE:	Process				Combined			
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		ATG 24 SAMPLING REQUIRED:	Yes				Yes			
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually			
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days			
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		TOXICITY TESTING REQUIRED:	No				Yes			
		TOXICITY TESTING FREQUENCY:	None				Monthly			
		TOXICITY TESTING MINIMUM INTERVAL:					15 days			
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No			
		FREQUENCY OF SAMPLING:	D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
19	Extractables, Base Neutral (continued)	Camphene				X				X
		1-Chloronaphthalene				X				X
		2-Chloronaphthalene				X				X
		Chrysene				X				X
		Dibenz(a,h)anthracene				X				X
		Fluoranthene				X				X
		Fluorene				X				X
		Indeno(1,2,3-cd)pyrene				X				X
		Indole				X				X
		1-Methylnaphthalene				X				X
		2-Methylnaphthalene				X				X
		Naphthalene			X					X
		Perylene				X				X
		Phenanthrene			X					X
		Pyrene				X				X
		Benzylbutylphthalate				X				X
		Bis(2-Ethylhexyl)phthalate				X				X
		Di-n-butylphthalate				X				X
		4-Bromophenyl phenyl ether				X				X

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined			
		EFFLUENT STREAM TYPE:	Process				Combined			
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		ATG 24 SAMPLING REQUIRED:	Yes				Yes			
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually			
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days			
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes			
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly			
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days			
		TOXICITY TESTING REQUIRED:	No				Yes			
		TOXICITY TESTING FREQUENCY:	None				Monthly			
		TOXICITY TESTING MINIMUM INTERVAL:					15 days			
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No			
		FREQUENCY OF SAMPLING:	D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
19	Extractables, Base Neutral (continued)	4-Chlorophenyl phenyl ether				X				X
		Bis(2-Chloroisopropyl)ether				X				X
		Bis(2-Chloroethyl)ether				X				X
		Diphenyl ether (NOTE 4)				X				X
		2,4-Dinitrotoluene				X				X
		2,6-Dinitrotoluene				X				X
		Bis(2-Chloroethoxy)methane				X				X
		Diphenylamine				X				X
		N-Nitrosodiphenylamine				X				X
		N-Nitrosodi-n-propylamine				X				X
20	Extractables, Acid (Phenolics)	2,3,4,5-Tetrachlorophenol				X				X
		2,3,4,6-Tetrachlorophenol				X				X
		2,3,5,6-Tetrachlorophenol				X				X
		2,3,4-Trichlorophenol				X				X
		2,3,5-Trichlorophenol				X				X
		2,4,5-Trichlorophenol				X				X
		2,4,6-Trichlorophenol				X				X
		2,4-Dimethylphenol				X				X

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

NAME OF EFFLUENT STREAM:			Foundry Process				Foundry Combined			
EFFLUENT STREAM TYPE:			Process				Combined			
CHARACTERIZATION SAMPLING REQUIRED:			Yes				Yes			
CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly				Quarterly			
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days				60 days			
ATG 24 SAMPLING REQUIRED:			Yes				Yes			
ATG 24 SAMPLING FREQUENCY:			Semi-annually				Semi-annually			
ATG 24 SAMPLING MINIMUM INTERVAL:			180 days				180 days			
OPEN CHARACTERIZATION SAMPLING REQUIRED:			Yes				Yes			
OPEN CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly				Quarterly			
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days				60 days			
TOXICITY TESTING REQUIRED:			No				Yes			
TOXICITY TESTING FREQUENCY:			None				Monthly			
TOXICITY TESTING MINIMUM INTERVAL:							15 days			
QUALITY CONTROL MONITORING REQUIRED:			Yes				No			
FREQUENCY OF SAMPLING:			D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
20	Extractables, Acid (Phenolics) (continued)	2,4-Dinitrophenol				X				X
		2,4-Dichlorophenol				X				X
		2,6-Dichlorophenol				X				X
		4,6-Dinitro-o-cresol				X				X
		2-Chlorophenol				X				X
		4-Chloro-3-methylphenol				X				X
		4-Nitrophenol				X				X
		m-Cresol				X				X
		o-Cresol				X				X
		p-Cresol				X				X
		Pentachlorophenol				X				X
		Phenol				X				X
25	Solvent Extractables	Oil and grease		X				X		
26	Fatty and Resin Acids					X				X
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)				X				X

SCHEDULE G: FORD MOTOR COMPANY OF CANADA LTD. - WINDSOR

NAME OF EFFLUENT STREAM:	Foundry Process	Foundry Combined
EFFLUENT STREAM TYPE:	Process	Combined
CHARACTERIZATION SAMPLING REQUIRED:	Yes	Yes
CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly	Quarterly
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days	60 days
ATG 24 SAMPLING REQUIRED:	Yes	Yes
ATG 24 SAMPLING FREQUENCY:	Semi-annually	Semi-annually
ATG 24 SAMPLING MINIMUM INTERVAL:	180 days	180 days
OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes	Yes
OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly	Quarterly
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days	60 days
TOXICITY TESTING REQUIRED:	No	Yes
TOXICITY TESTING FREQUENCY:	None	Monthly
TOXICITY TESTING MINIMUM INTERVAL:		15 days
QUALITY CONTROL MONITORING REQUIRED:	Yes	No

		FREQUENCY OF SAMPLING:	D	TW	W	M	D	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED								
MC1	Metals	Iron		X				X		
		Magnesium		X				X		
MC2	Fluoride	Fluoride		X				X		

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

NOTE 3: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Detection Limit of 0.6 micrograms per litre.

NOTE 4: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Detection Limit of 0.4 micrograms per litre.

SCHEDULE H: FRANKLIN ELECTRIC OF CANADA LTD. - STRATHROY

		NAME OF EFFLUENT STREAM:	Cooling Pond Overflow
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	Yes
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Quarterly
		TOXICITY TESTING MINIMUM INTERVAL:	60 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X
5a	Organic carbon	Dissolved organic carbon (DOC)	X
5b		Total organic carbon (TOC)	
8	Suspended solids	Total suspended solids (TSS)	X
		Volatile suspended solids (VSS)	
9	Total metals	Aluminum	X
		Beryllium	X
		Cadmium	X
		Chromium	X
		Cobalt	X
		Copper	X
		Lead	X
		Molybdenum	X
		Nickel	X
		Silver	X

SCHEDULE H: FRANKLIN ELECTRIC OF CANADA LTD. - STRATHROY

		NAME OF EFFLUENT STREAM:	Cooling Pond Overflow
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	Yes
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Quarterly
		TOXICITY TESTING MINIMUM INTERVAL:	60 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
9	Total metals (continued)	Thallium	X
		Vanadium	X
		Zinc	X
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	X
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead	X
		Tri-alkyl lead	X
25	Solvent Extractables	Oil and grease	X
MC1	Metals	Iron	X
		Magnesium	X

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined		
		EFFLUENT STREAM TYPE:	Process				Combined		
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		ATG 24 SAMPLING REQUIRED:	Yes				Yes		
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually		
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days		
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		TOXICITY TESTING REQUIRED:	No				Yes		
		TOXICITY TESTING FREQUENCY:	None				Monthly		
		TOXICITY TESTING MINIMUM INTERVAL:					15 days		
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No		
		FREQUENCY OF SAMPLING:	D	TW	W	M	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED							
1	Chemical Oxygen Demand	Chemical oxygen demand (COD)		X				X	
2	Total cyanide	Total cyanide				X			X
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X				X		
4a	Nitrogen	Ammonia plus Ammonium				X			X
		Total Kjeldahl nitrogen							
4b	Nitrogen	Nitrate + Nitrite				X			
5a	Organic carbon	Dissolved organic carbon (DOC)			X			X	
5b	Organic carbon	Total organic carbon (TOC)							
6	Total phosphorus	Total phosphorus			X			X	
7	Specific conductance	Specific conductance	X				X		

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined		
		EFFLUENT STREAM TYPE:	Process				Combined		
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		ATG 24 SAMPLING REQUIRED:	Yes				Yes		
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually		
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days		
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		TOXICITY TESTING REQUIRED:	No				Yes		
		TOXICITY TESTING FREQUENCY:	None				Monthly		
		TOXICITY TESTING MINIMUM INTERVAL:					15 days		
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No		
		FREQUENCY OF SAMPLING:	D	TW	W	M	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED							
8	Suspended solids	Total suspended solids (TSS)	X				X		
		Volatile suspended solids (VSS)							
9	Total metals	Aluminum		X				X	
		Beryllium		X				X	
		Cadmium		X				X	
		Chromium		X				X	
		Cobalt		X				X	
		Copper		X				X	
		Lead		X				X	
		Molybdenum		X				X	
		Nickel		X				X	
		Silver		X				X	
		Thallium		X				X	
		Vanadium		X				X	
		Zinc		X				X	
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)		X				X	

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined		
		EFFLUENT STREAM TYPE:	Process				Combined		
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		ATG 24 SAMPLING REQUIRED:	Yes				Yes		
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually		
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days		
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		TOXICITY TESTING REQUIRED:	No				Yes		
		TOXICITY TESTING FREQUENCY:	None				Monthly		
		TOXICITY TESTING MINIMUM INTERVAL:					15 days		
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No		
		FREQUENCY OF SAMPLING:	D	TW	W	M	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED							
12	Mercury	Mercury				X			
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead				X			X
		Tri-alkyl lead				X			X
14	Phenolics (4AAP)	Phenolics (4AAP)	X				X		
15	Sulphide	Sulphide				X			
16	Volatiles, Halogenated	1,1,2,2-Tetrachloroethane				X			
		1,1,2-Trichloroethane				X			
		1,1-Dichloroethane				X			
		1,1-Dichloroethylene				X			
		1,2-Dichlorobenzene				X			
		1,2-Dichloroethane (Ethylene dichloride)				X			
		1,2-Dichloropropane				X			
		1,3-Dichlorobenzene				X			
		1,4-Dichlorobenzene				X			
		Bromoform				X			

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined		
		EFFLUENT STREAM TYPE:	Process				Combined		
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		ATG 24 SAMPLING REQUIRED:	Yes				Yes		
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually		
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days		
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		TOXICITY TESTING REQUIRED:	No				Yes		
		TOXICITY TESTING FREQUENCY:	None				Monthly		
		TOXICITY TESTING MINIMUM INTERVAL:					15 days		
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No		
		FREQUENCY OF SAMPLING:	D	TW	W	M	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED							
16	Volatiles, Halogenated (continued)	Bromomethane				X			
		Carbon tetrachloride				X			
		Chlorobenzene				X			
		Chloroform				X			
		Chloromethane				X			
		Cis-1,3-Dichloropropylene				X			
		Dibromochloromethane				X			
		Ethylene dibromide				X			
		Methylene chloride				X			
		Tetrachloroethylene (Perchloroethylene)				X			
		Trans-1,2-Dichloroethylene				X			
		Trans-1,3-Dichloropropylene				X			
		Trichloroethylene				X			
		Trichlorofluoromethane				X			
		Vinyl chloride (Chloroethylene)				X			

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

NAME OF EFFLUENT STREAM:			Foundry Process				Foundry Combined		
EFFLUENT STREAM TYPE:			Process				Combined		
CHARACTERIZATION SAMPLING REQUIRED:			Yes				Yes		
CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly				Quarterly		
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days				60 days		
ATG 24 SAMPLING REQUIRED:			Yes				Yes		
ATG 24 SAMPLING FREQUENCY:			Semi-annually				Semi-annually		
ATG 24 SAMPLING MINIMUM INTERVAL:			180 days				180 days		
OPEN CHARACTERIZATION SAMPLING REQUIRED:			Yes				Yes		
OPEN CHARACTERIZATION SAMPLING FREQUENCY:			Quarterly				Quarterly		
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			60 days				60 days		
TOXICITY TESTING REQUIRED:			No				Yes		
TOXICITY TESTING FREQUENCY:			None				Monthly		
TOXICITY TESTING MINIMUM INTERVAL:							15 days		
QUALITY CONTROL MONITORING REQUIRED:			Yes				No		
FREQUENCY OF SAMPLING:			D	TW	W	M	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED							
17	Volatiles, Non-Halogenated	Benzene				X			
		Styrene				X			
		Toluene				X			
		o-Xylene				X			
		m-Xylene and p-Xylene				X			
18	Volatiles, Water Soluble	Acrolein				X			
		Acrylonitrile				X			
19	Extractables, Base Neutral	Acenaphthene				X			X
		5-nitro Acenaphthene				X			X
		Acenaphthylene				X			X
		Anthracene				X			X
		Benz(a)anthracene				X			X
		Benzo(a)pyrene				X			X
		Benzo(b)fluoranthene				X			X
		Benzo(g,h,i)perylene				X			X
		Benzo(k)fluoranthene				X			X
		Biphenyl (NOTE 3)				X			X

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined		
		EFFLUENT STREAM TYPE:	Process				Combined		
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		ATG 24 SAMPLING REQUIRED:	Yes				Yes		
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually		
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days		
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		TOXICITY TESTING REQUIRED:	No				Yes		
		TOXICITY TESTING FREQUENCY:	None				Monthly		
		TOXICITY TESTING MINIMUM INTERVAL:					15 days		
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No		
		FREQUENCY OF SAMPLING:	D	TW	W	M	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED							
19	Extractables, Base Neutral (continued)	Camphene				X			X
		1-Chloronaphthalene				X			X
		2-Chloronaphthalene				X			X
		Chrysene				X			X
		Dibenz(a,h)anthracene				X			X
		Fluoranthene				X			X
		Fluorene				X			X
		Indeno(1,2,3-cd)pyrene				X			X
		Indole				X			X
		1-Methylnaphthalene				X			X
		2-Methylnaphthalene				X			X
		Naphthalene			X				X
		Perylene				X			X
		Phenanthrene			X				X
		Pyrene				X			X
		Benzylbutylphthalate				X			X
		Bis(2-Ethylhexyl)phthalate				X			X
		Di-n-butylphthalate				X			X
		4-Bromophenyl phenyl ether				X			X

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined		
		EFFLUENT STREAM TYPE:	Process				Combined		
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		ATG 24 SAMPLING REQUIRED:	Yes				Yes		
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually		
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days		
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		TOXICITY TESTING REQUIRED:	No				Yes		
		TOXICITY TESTING FREQUENCY:	None				Monthly		
		TOXICITY TESTING MINIMUM INTERVAL:					15 days		
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No		
		FREQUENCY OF SAMPLING:	D	TW	W	M	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED							
19	Extractables, Base Neutral (continued)	4-Chlorophenyl phenyl ether				X			X
		Bis(2-Chloroisopropyl)ether				X			X
		Bis(2-Chloroethyl)ether				X			X
		Diphenyl ether (NOTE 4)				X			X
		2,4-Dinitrotoluene				X			X
		2,6-Dinitrotoluene				X			X
		Bis(2-Chloroethoxy)methane				X			X
		Diphenylamine				X			X
		N-Nitrosodiphenylamine				X			X
		N-Nitrosodi-n-propylamine				X			X
20	Extractables, Acid (Phenolics)	2,3,4,5-Tetrachlorophenol				X			X
		2,3,4,6-Tetrachlorophenol				X			X
		2,3,5,6-Tetrachlorophenol				X			X
		2,3,4-Trichlorophenol				X			X
		2,3,5-Trichlorophenol				X			X
		2,4,5-Trichlorophenol				X			X
		2,4,6-Trichlorophenol				X			X
		2,4-Dimethylphenol				X			X

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

			Foundry Process				Foundry Combined		
		NAME OF EFFLUENT STREAM:	Foundry Process				Foundry Combined		
		EFFLUENT STREAM TYPE:	Process				Combined		
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		ATG 24 SAMPLING REQUIRED:	Yes				Yes		
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				Semi-annually		
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				180 days		
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				Yes		
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				Quarterly		
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				60 days		
		TOXICITY TESTING REQUIRED:	No				Yes		
		TOXICITY TESTING FREQUENCY:	None				Monthly		
		TOXICITY TESTING MINIMUM INTERVAL:					15 days		
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No		
		FREQUENCY OF SAMPLING:	D	TW	W	M	TW	W	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED							
20	Extractables, Acid (Phenolics) (continued)	2,4-Dinitrophenol				X			X
		2,4-Dichlorophenol				X			X
		2,6-Dichlorophenol				X			X
		4,6-Dinitro-o-cresol				X			X
		2-Chlorophenol				X			X
		4-Chloro-3-methylphenol				X			X
		4-Nitrophenol				X			X
		m-Cresol				X			X
		o-Cresol				X			X
		p-Cresol				X			X
		Pentachlorophenol				X			X
		Phenol				X			X
25	Solvent Extractables	Oil and grease		X			X		
26	Fatty and Resin Acids					X			
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)				X			X

SCHEDULE I: GENERAL MOTORS OF CANADA LTD. - ST. CATHARINES

NAME OF EFFLUENT STREAM:	Foundry Process	Foundry Combined
EFFLUENT STREAM TYPE:	Process	Combined
CHARACTERIZATION SAMPLING REQUIRED:	Yes	Yes
CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly	Quarterly
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days	60 days
ATG 24 SAMPLING REQUIRED:	Yes	Yes
ATG 24 SAMPLING FREQUENCY:	Semi-annually	Semi-annually
ATG 24 SAMPLING MINIMUM INTERVAL:	180 days	180 days
OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes	Yes
OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly	Quarterly
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days	60 days
TOXICITY TESTING REQUIRED:	No	Yes
TOXICITY TESTING FREQUENCY:	None	Monthly
TOXICITY TESTING MINIMUM INTERVAL:		15 days
QUALITY CONTROL MONITORING REQUIRED:	Yes	No

ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	D	TW	W	M	TW	W	M
MC1	Metals	Iron		X				X	
		Magnesium		X				X	
MC2	Fluoride	Fluoride				X			

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

NOTE 3: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Detection Limit of 0.6 micrograms per litre.

NOTE 4: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Detection Limit of 0.4 micrograms per litre.

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

NAME OF EFFLUENT STREAM:	East Process Sewer	West Process Sewer
EFFLUENT STREAM TYPE:	Process	Storm
CHARACTERIZATION SAMPLING REQUIRED:	Yes	No
CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly	None
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days	
ATG 24 SAMPLING REQUIRED:	Yes	No
ATG 24 SAMPLING FREQUENCY:	Semi-annually	None
ATG 24 SAMPLING MINIMUM INTERVAL:	180 days	
OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes	No
OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly	None
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days	
TOXICITY TESTING REQUIRED:	Yes	No
TOXICITY TESTING FREQUENCY:	Monthly	None
TOXICITY TESTING MINIMUM INTERVAL:	15 days	
QUALITY CONTROL MONITORING REQUIRED:	Yes	No

		FREQUENCY OF SAMPLING:	East Process Sewer				West Process Sewer
			D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
1	Chemical Oxygen Demand	Chemical oxygen demand (COD)		X			X
2	Total cyanide	Total cyanide				X	X
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X				
4a	Nitrogen	Ammonia plus Ammonium		X			X
		Total Kjeldahl nitrogen					
4b	Nitrogen	Nitrate + Nitrite			X		X
5a	Organic carbon	Dissolved organic carbon (DOC)			X		X
5b	Organic carbon	Total organic carbon (TOC)					
6	Total phosphorus	Total phosphorus			X		X
7	Specific conductance	Specific conductance	X				

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

		NAME OF EFFLUENT STREAM:	East Process Sewer				West Process Sewer
		EFFLUENT STREAM TYPE:	Process				Storm
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		ATG 24 SAMPLING REQUIRED:	Yes				No
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				None
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		TOXICITY TESTING REQUIRED:	Yes				No
		TOXICITY TESTING FREQUENCY:	Monthly				None
		TOXICITY TESTING MINIMUM INTERVAL:	15 days				
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No
		FREQUENCY OF SAMPLING:	D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
8	Suspended solids	Total suspended solids (TSS)	X				X
		Volatile suspended solids (VSS)					
9	Total metals	Aluminum		X			X
		Beryllium		X			X
		Cadmium		X			X
		Chromium		X			X
		Cobalt		X			X
		Copper		X			X
		Lead		X			X
		Molybdenum		X			X
		Nickel		X			X
		Silver		X			X
		Thallium		X			X
		Vanadium		X			X
		Zinc		X			X
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)		X			X

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

		NAME OF EFFLUENT STREAM:	East Process Sewer				West Process Sewer
		EFFLUENT STREAM TYPE:	Process				Storm
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		ATG 24 SAMPLING REQUIRED:	Yes				No
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				None
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		TOXICITY TESTING REQUIRED:	Yes				No
		TOXICITY TESTING FREQUENCY:	Monthly				None
		TOXICITY TESTING MINIMUM INTERVAL:	15 days				
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No
		FREQUENCY OF SAMPLING:	D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
12	Mercury	Mercury				X	
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead				X	X
		Tri-alkyl lead				X	X
14	Phenolics (4AAP)	Phenolics (4AAP)	X				X
15	Sulphide	Sulphide				X	X
16	Volatiles, Halogenated	1,1,2,2-Tetrachloroethane				X	
		1,1,2-Trichloroethane				X	
		1,1-Dichloroethane				X	
		1,1-Dichloroethylene				X	
		1,2-Dichlorobenzene				X	
		1,2-Dichloroethane (Ethylene dichloride)				X	
		1,2-Dichloropropane				X	
		1,3-Dichlorobenzene				X	
		1,4-Dichlorobenzene				X	
		Bromoform				X	

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

		NAME OF EFFLUENT STREAM:	East Process Sewer				West Process Sewer
		EFFLUENT STREAM TYPE:	Process				Storm
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		ATG 24 SAMPLING REQUIRED:	Yes				No
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				None
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		TOXICITY TESTING REQUIRED:	Yes				No
		TOXICITY TESTING FREQUENCY:	Monthly				None
		TOXICITY TESTING MINIMUM INTERVAL:	15 days				
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No
		FREQUENCY OF SAMPLING:	D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
16	Volatiles, Halogenated (continued)	Bromomethane				X	
		Carbon tetrachloride				X	
		Chlorobenzene				X	
		Chloroform				X	
		Chloromethane				X	
		Cis-1,3-Dichloropropylene				X	
		Dibromochloromethane				X	
		Ethylene dibromide				X	
		Methylene chloride				X	
		Tetrachloroethylene (Perchloroethylene)				X	
		Trans-1,2-Dichloroethylene				X	
		Trans-1,3-Dichloropropylene				X	
		Trichloroethylene				X	
		Trichlorofluoromethane				X	
		Vinyl chloride (Chloroethylene)				X	

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

		NAME OF EFFLUENT STREAM:	East Process Sewer				West Process Sewer
		EFFLUENT STREAM TYPE:	Process				Storm
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		ATG 24 SAMPLING REQUIRED:	Yes				No
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				None
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		TOXICITY TESTING REQUIRED:	Yes				No
		TOXICITY TESTING FREQUENCY:	Monthly				None
		TOXICITY TESTING MINIMUM INTERVAL:	15 days				
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No
		FREQUENCY OF SAMPLING:	D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
17	Volatiles, Non-Halogenated	Benzene				X	
		Styrene				X	
		Toluene				X	
		o-Xylene				X	
		m-Xylene and p-Xylene				X	
19	Extractables, Base Neutral	Acenaphthene				X	
		5-nitro Acenaphthene				X	
		Acenaphthylene				X	
		Anthracene				X	
		Benz(a)anthracene				X	
		Benzo(a)pyrene				X	
		Benzo(b)fluoranthene				X	
		Benzo(g,h,i)perylene				X	
		Benzo(k)fluoranthene				X	
		Biphenyl (NOTE 3)				X	
		Camphene				X	
		1-Chloronaphthalene				X	
		2-Chloronaphthalene				X	

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

		NAME OF EFFLUENT STREAM:	East Process Sewer				West Process Sewer
		EFFLUENT STREAM TYPE:	Process				Storm
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		ATG 24 SAMPLING REQUIRED:	Yes				No
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				None
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		TOXICITY TESTING REQUIRED:	Yes				No
		TOXICITY TESTING FREQUENCY:	Monthly				None
		TOXICITY TESTING MINIMUM INTERVAL:	15 days				
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No
		FREQUENCY OF SAMPLING:	D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
19	Extractables, Base Neutral (continued)	Chrysene				X	
		Dibenz(a,h)anthracene				X	
		Fluoranthene				X	
		Fluorene				X	
		Indeno(1,2,3-cd)pyrene				X	
		Indole				X	
		1-Methylnaphthalene				X	
		2-Methylnaphthalene				X	
		Naphthalene				X	
		Perylene				X	
		Phenanthrene				X	
		Pyrene				X	
		Benzylbutylphthalate				X	
		Bis(2-Ethylhexyl)phthalate				X	
		Di-n-butylphthalate				X	
		4-Bromophenyl phenyl ether				X	
		4-Chlorophenyl phenyl ether				X	
		Bis(2-Chloroisopropyl)ether				X	
		Bis(2-Chloroethyl)ether				X	

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

		NAME OF EFFLUENT STREAM:	East Process Sewer				West Process Sewer
		EFFLUENT STREAM TYPE:	Process				Storm
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		ATG 24 SAMPLING REQUIRED:	Yes				No
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				None
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		TOXICITY TESTING REQUIRED:	Yes				No
		TOXICITY TESTING FREQUENCY:	Monthly				None
		TOXICITY TESTING MINIMUM INTERVAL:	15 days				
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No
		FREQUENCY OF SAMPLING:	D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
19	Extractables, Base Neutral (continued)	Diphenyl ether (NOTE 4)				X	
		2,4-Dinitrotoluene				X	
		2,6-Dinitrotoluene				X	
		Bis(2-Chloroethoxy)methane				X	
		Diphenylamine				X	
		N-Nitrosodiphenylamine				X	
		N-Nitrosodi-n-propylamine				X	
20	Extractables, Acid (Phenolics)	2,3,4,5-Tetrachlorophenol				X	
		2,3,4,6-Tetrachlorophenol				X	
		2,3,5,6-Tetrachlorophenol				X	
		2,3,4-Trichlorophenol				X	
		2,3,5-Trichlorophenol				X	
		2,4,5-Trichlorophenol				X	
		2,4,6-Trichlorophenol				X	
		2,4-Dimethylphenol				X	
		2,4-Dinitrophenol				X	
		2,4-Dichlorophenol				X	
		2,6-Dichlorophenol				X	

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

		NAME OF EFFLUENT STREAM:	East Process Sewer				West Process Sewer
		EFFLUENT STREAM TYPE:	Process				Storm
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		ATG 24 SAMPLING REQUIRED:	Yes				No
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				None
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		TOXICITY TESTING REQUIRED:	Yes				No
		TOXICITY TESTING FREQUENCY:	Monthly				None
		TOXICITY TESTING MINIMUM INTERVAL:	15 days				
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No
		FREQUENCY OF SAMPLING:	D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
20	Extractables, Acid (Phenolics) (continued)	4,6-Dinitro-o-cresol				X	
		2-Chlorophenol				X	
		4-Chloro-3-methylphenol				X	
		4-Nitrophenol				X	
		m-Cresol				X	
		o-Cresol				X	
		p-Cresol				X	
		Pentachlorophenol				X	
		Phenol				X	
25	Solvent Extractables	Oil and grease		X			X
26	Fatty and Resin Acids					X	
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)				X	

SCHEDULE J: HALEY INDUSTRIES LTD. - HALEY

		NAME OF EFFLUENT STREAM:	East Process Sewer				West Process Sewer
		EFFLUENT STREAM TYPE:	Process				Storm
		CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		ATG 24 SAMPLING REQUIRED:	Yes				No
		ATG 24 SAMPLING FREQUENCY:	Semi-annually				None
		ATG 24 SAMPLING MINIMUM INTERVAL:	180 days				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	Yes				No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	Quarterly				None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	60 days				
		TOXICITY TESTING REQUIRED:	Yes				No
		TOXICITY TESTING FREQUENCY:	Monthly				None
		TOXICITY TESTING MINIMUM INTERVAL:	15 days				
		QUALITY CONTROL MONITORING REQUIRED:	Yes				No
		FREQUENCY OF SAMPLING:	D	TW	W	M	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED					
MC1	Metals	Iron		X			X
		Magnesium		X			X
MC2	Fluoride	Fluoride		X			X

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

NOTE 3: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Detection Limit of 0.6 micrograms per litre.

NOTE 4: Follow the Sampling & Analytical Principles outlined for Analytical Test Group 19 in Schedule 2 and in Part B of Schedule 3 in the General Effluent Monitoring Regulation with an Analytical Detection Limit of 0.4 micrograms per litre.

SCHEDULE K: MAGALLOY LTD. - STRATFORD

NAME OF EFFLUENT STREAM:	Cooling Tank
EFFLUENT STREAM TYPE:	Cooling Water
CHARACTERIZATION SAMPLING REQUIRED:	No
CHARACTERIZATION SAMPLING FREQUENCY:	None
CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
ATG 24 SAMPLING REQUIRED:	No
ATG 24 SAMPLING FREQUENCY:	None
ATG 24 SAMPLING MINIMUM INTERVAL:	
OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
TOXICITY TESTING REQUIRED:	Yes
TOXICITY TESTING FREQUENCY:	Semi-annually
TOXICITY TESTING MINIMUM INTERVAL:	180 days
QUALITY CONTROL MONITORING REQUIRED:	No

		FREQUENCY OF SAMPLING:	M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED		
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X	
5a	Organic carbon	Dissolved organic carbon (DOC)	X	
5b		Total organic carbon (TOC)		
8	Suspended solids	Total suspended solids (TSS)	X	
		Volatile suspended solids (VSS)		
9	Total metals	Aluminum	X	
		Beryllium	X	
		Cadmium	X	
		Chromium	X	
		Cobalt	X	
		Copper	X	
		Lead	X	
		Molybdenum	X	
		Nickel	X	
		Silver	X	

SCHEDULE K: MAGALLOY LTD. - STRATFORD

NAME OF EFFLUENT STREAM:	Cooling Tank
EFFLUENT STREAM TYPE:	Cooling Water
CHARACTERIZATION SAMPLING REQUIRED:	No
CHARACTERIZATION SAMPLING FREQUENCY: CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	None
ATG 24 SAMPLING REQUIRED:	No
ATG 24 SAMPLING FREQUENCY: ATG 24 SAMPLING MINIMUM INTERVAL:	None
OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
OPEN CHARACTERIZATION SAMPLING FREQUENCY: OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	None
TOXICITY TESTING REQUIRED:	Yes
TOXICITY TESTING FREQUENCY: TOXICITY TESTING MINIMUM INTERVAL:	Semi-annually 180 days
QUALITY CONTROL MONITORING REQUIRED:	No

			FREQUENCY OF SAMPLING:	
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	M	Q
9	Total metals (continued)	Thallium	X	
		Vanadium	X	
		Zinc	X	
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	X	
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead	X	
		Tri-alkyl lead	X	
14	Phenolics (4AAP)	Phenolics (4AAP)	X	
25	Solvent Extractables	Oil and grease	X	
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)		X

SCHEDULE K: MAGALLOY LTD. - STRATFORD

NAME OF EFFLUENT STREAM:			Cooling Tank	
EFFLUENT STREAM TYPE:			Cooling Water	
CHARACTERIZATION SAMPLING REQUIRED:			No	
CHARACTERIZATION SAMPLING FREQUENCY: CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			None	
ATG 24 SAMPLING REQUIRED:			No	
ATG 24 SAMPLING FREQUENCY: ATG 24 SAMPLING MINIMUM INTERVAL:			None	
OPEN CHARACTERIZATION SAMPLING REQUIRED:			No	
OPEN CHARACTERIZATION SAMPLING FREQUENCY: OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:			None	
TOXICITY TESTING REQUIRED:			Yes	
TOXICITY TESTING FREQUENCY: TOXICITY TESTING MINIMUM INTERVAL:			Semi-annually 180 days	
QUALITY CONTROL MONITORING REQUIRED:			No	
FREQUENCY OF SAMPLING:			M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED		
MC1	Metals	Iron	X	
		Magnesium	X	

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE L: RICHMOND DIE CASTING LTD. - CORNWALL

		NAME OF EFFLUENT STREAM:	12 Inch Outlet Sewer
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	No
		CHARACTERIZATION SAMPLING FREQUENCY:	None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Semi-annually
		TOXICITY TESTING MINIMUM INTERVAL:	180 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X
5a	Organic carbon	Dissolved organic carbon (DOC)	X
5b		Total organic carbon (TOC)	
8	Suspended solids	Total suspended solids (TSS)	X
		Volatile suspended solids (VSS)	
9	Total metals	Aluminum	X
		Beryllium	X
		Cadmium	X
		Chromium	X
		Cobalt	X
		Copper	X
		Lead	X
		Molybdenum	X
		Nickel	X
		Silver	X

SCHEDULE L: RICHMOND DIE CASTING LTD. - CORNWALL

		NAME OF EFFLUENT STREAM:	12 Inch Outlet Sewer
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	No
		CHARACTERIZATION SAMPLING FREQUENCY:	None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Semi-annually
		TOXICITY TESTING MINIMUM INTERVAL:	180 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
9	Total metals (continued)	Thallium	X
		Vanadium	X
		Zinc	X
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	X
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead	X
		Tri-alkyl lead	X
25	Solvent Extractables	Oil and grease	X
MC1	Metals	Iron	X
		Magnesium	X

SCHEDULE L: RICHMOND DIE CASTING LTD. - CORNWALL

		NAME OF EFFLUENT STREAM:	12 Inch Outlet Sewer
		EFFLUENT STREAM TYPE:	Cooling Water
		CHARACTERIZATION SAMPLING REQUIRED:	No
		CHARACTERIZATION SAMPLING FREQUENCY:	None
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		ATG 24 SAMPLING REQUIRED:	No
		ATG 24 SAMPLING FREQUENCY:	None
		ATG 24 SAMPLING MINIMUM INTERVAL:	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	
		TOXICITY TESTING REQUIRED:	Yes
		TOXICITY TESTING FREQUENCY:	Semi-annually
		TOXICITY TESTING MINIMUM INTERVAL:	180 days
		QUALITY CONTROL MONITORING REQUIRED:	No
		FREQUENCY OF SAMPLING:	M
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED	
MC2	Fluoride	Fluoride	X

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

SCHEDULE M: WESTERN FOUNDRY COMPANY LTD. - WINGHAM

		NAME OF EFFLUENT STREAM:	Furnace Cooling Water Sewer		Core Machine/Compressor Cooling Water Sewer	
		EFFLUENT STREAM TYPE:	Cooling Water		Cooling Water	
		CHARACTERIZATION SAMPLING REQUIRED:	No		No	
		CHARACTERIZATION SAMPLING FREQUENCY:	None		None	
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:				
		ATG 24 SAMPLING REQUIRED:	No		No	
		ATG 24 SAMPLING FREQUENCY:	None		None	
		ATG 24 SAMPLING MINIMUM INTERVAL:				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No		No	
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None		None	
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:				
		TOXICITY TESTING REQUIRED:	Yes		Yes	
		TOXICITY TESTING FREQUENCY:	Semi-annually		Semi-annually	
		TOXICITY TESTING MINIMUM INTERVAL:	180 days		180 days	
		QUALITY CONTROL MONITORING REQUIRED:	No		No	
		FREQUENCY OF SAMPLING:	M	Q	M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED				
3	Hydrogen ion (pH)	Hydrogen ion (pH)	X		X	
5a	Organic carbon	Dissolved organic carbon (DOC)	X		X	
5b		Total organic carbon (TOC)				
8	Suspended solids	Total suspended solids (TSS)	X		X	
		Volatile suspended solids (VSS)				
9	Total metals	Aluminum	X		X	
		Beryllium	X		X	
		Cadmium	X		X	
		Chromium	X		X	
		Cobalt	X		X	
		Copper	X		X	
		Lead	X		X	
		Molybdenum	X		X	
		Nickel	X		X	

SCHEDULE M: WESTERN FOUNDRY COMPANY LTD. - WINGHAM

		NAME OF EFFLUENT STREAM:	Furnace Cooling Water Sewer		Core Machine/Compressor Cooling Water Sewer	
		EFFLUENT STREAM TYPE:	Cooling Water		Cooling Water	
		CHARACTERIZATION SAMPLING REQUIRED:	No		No	
		CHARACTERIZATION SAMPLING FREQUENCY: CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	None		None	
		ATG 24 SAMPLING REQUIRED:	No		No	
		ATG 24 SAMPLING FREQUENCY: ATG 24 SAMPLING MINIMUM INTERVAL:	None		None	
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No		No	
		OPEN CHARACTERIZATION SAMPLING FREQUENCY: OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:	None		None	
		TOXICITY TESTING REQUIRED:	Yes		Yes	
		TOXICITY TESTING FREQUENCY: TOXICITY TESTING MINIMUM INTERVAL:	Semi-annually 180 days		Semi-annually 180 days	
		QUALITY CONTROL MONITORING REQUIRED:	No		No	
		FREQUENCY OF SAMPLING:	M	Q	M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED				
9	Total metals (continued)	Silver	X		X	
		Thallium	X		X	
		Vanadium	X		X	
		Zinc	X		X	
11	Chromium (Hexavalent) (NOTE 1)	Chromium (Hexavalent)	X		X	
13	Total alkyl lead (NOTE 2)	Tetra-alkyl lead	X		X	
		Tri-alkyl lead	X		X	
14	Phenolics (4AAP)	Phenolics (4AAP)	X		X	
25	Solvent Extractables	Oil and grease	X		X	
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)		X		X

SCHEDULE M: WESTERN FOUNDRY COMPANY LTD. - WINGHAM

		NAME OF EFFLUENT STREAM:	Furnace Cooling Water Sewer		Core Machine/Compressor Cooling Water Sewer	
		EFFLUENT STREAM TYPE:	Cooling Water		Cooling Water	
		CHARACTERIZATION SAMPLING REQUIRED:	No		No	
		CHARACTERIZATION SAMPLING FREQUENCY:	None		None	
		CHARACTERIZATION SAMPLING MINIMUM INTERVAL:				
		ATG 24 SAMPLING REQUIRED:	No		No	
		ATG 24 SAMPLING FREQUENCY:	None		None	
		ATG 24 SAMPLING MINIMUM INTERVAL:				
		OPEN CHARACTERIZATION SAMPLING REQUIRED:	No		No	
		OPEN CHARACTERIZATION SAMPLING FREQUENCY:	None		None	
		OPEN CHARACTERIZATION SAMPLING MINIMUM INTERVAL:				
		TOXICITY TESTING REQUIRED:	Yes		Yes	
		TOXICITY TESTING FREQUENCY:	Semi-annually		Semi-annually	
		TOXICITY TESTING MINIMUM INTERVAL:	180 days		180 days	
		QUALITY CONTROL MONITORING REQUIRED:	No		No	
		FREQUENCY OF SAMPLING:	M	Q	M	Q
ANALYTICAL TEST GROUP		PARAMETERS TO BE ANALYZED				
MC1	Metals	Iron	X		X	
		Magnesium	X		X	
MC2	Fluoride	Fluoride	X		X	

NOTE 1: Analyze for hexavalent chromium only if the total chromium concentration is greater than 1 milligram per litre.

NOTE 2: Analyze for alkyl leads only if the total lead concentration is greater than 1 milligram per litre.

PART IV

EXPLANATORY NOTES TO THE EFFLUENT MONITORING REGULATION FOR THE METAL CASTING SECTOR

PART IV - EXPLANATORY NOTES TO THE EFFLUENT MONITORING REGULATION FOR THE METAL CASTING SECTOR

INTRODUCTION

These Explanatory Notes provide an expanded description of each of the sections in the Effluent Monitoring Regulation for the Metal Casting Sector in order to further the reader's understanding of the regulatory requirements.

In conjunction with the protocols and procedures outlined in Ontario Regulation 695/88 as amended to Ontario Regulation 533/89, the General Effluent Monitoring Regulation, the Metal Casting Sector Regulation specifies the effluent monitoring requirements for each discharger, including sampling, analysis, flow measurement, toxicity testing and reporting.

SECTION 1: DEFINITIONS

This section does not redefine terms which are already defined in the Environmental Protection Act under which the Metal Casting Sector Regulation is written.

This section of the Regulation provides:

- clarification of the terms used in the Regulation having several possible interpretations;
- definitions of the technical terms used in the Regulation which may not be in common usage;
- definitions of the terms which have different meanings in the Regulation than those found in a dictionary or through common use;
- definitions of those terms which have different uses in the Metal Casting Sector Regulation than those in the General Regulation; and
- definitions of the terms which are specific to the Metal Casting Sector.

Subsection 1(2) states that the definitions in section 1 of the General Regulation also apply to this Regulation. However, a re-defined term in the Metal Casting Sector Regulation supercedes that of the General Regulation.

All of the definitions in the General Regulation have been applied to the Metal Casting Sector Regulation with the following exceptions:

- characterization has been redefined to reference the metal casting sector characterization schedules which are specific to the metal casting sector;
- combined effluent has been redefined to include storm water;
- Cooling water has been redefined to specify discharge to a surface water course;
- grab sample has been redefined to reference the appropriate laboratory sample containers for compounds specific to the metal casting sector monitoring list.

The following definitions are included in the Metal Casting Sector Regulation rather than the General Regulation as they are referred to only in the context of the Metal Casting Sector Regulation:

- process change;
- Quarterly and
- Semi-annually

SECTION 2: PURPOSE

The purpose of the Metal Casting Sector Regulation is to establish a data base on effluent quality in the Metal Casting Sector that will be used, along with other pertinent information such as available treatment technology, to develop effluent limits for the Metal Casting Sector.

SECTION 3: APPLICATION

Subsections (2) lists the metal casting sector companies, site specific monitoring schedules, the characterization parameter schedules and the plants that are required to report storm events in the Regulation which apply to each plant. This Regulation only applies to those plants and to those effluent streams named in the site specific monitoring schedules.

Subsection (3) states that the Metal Casting Sector Regulation is a Sectoral Effluent Monitoring Regulation in the context of the General Effluent Monitoring Regulation.

Subsection (4) states that all the monitoring obligations of the Metal Casting Sector Regulation shall be carried out in accordance with the requirements of the General Effluent Monitoring Regulation and Schedules CC and DD to the Metal Casting Sector Regulation.

Subsection (5) states the analytical method used in the Metal Casting Sector Regulation will conform with those methods listed in the General Effluent Monitoring Regulation as well as those methods listed in Schedule DD to the Metal Casting Sector Regulation.

Subsection (6) states that sampling and analytical obligations for biphenyl and diphenyl ether, two parameters for which laboratory procedures have recently been developed, shall be carried out in accordance with Notes 3 and 4 to the characterization parameters schedule for each direct discharger's plant.

Subsection (7) pertains to the made of the wettable surfaces of sampling equipments which must be used for the collection of samples that will be analyzed for parameters listed in Schedule AA. For example, fluorocarbon resins, glass or stainless steel will be used for the collection of samples to be analyzed for parameters in the analytical test group 26.

Subsection (8) allows the use of a short section surgical grade silicone rubber tubing or other tubing approved by the Regional Director in the event that such tubing cannot be replaced by a material mentioned in subsection (7).

Subsection (9) links the requirements of sampling principles in the General Effluent Monitoring Regulation with those in the Metal Casting Sector Regulation.

Subsection (10) States that the direct discharger may not be required to collect the minimum sample volume stated in Column 5 of Schedule CC as long as the direct discharger can meet the analytical method detection limit stated in Column 6 of Schedule DD.

Subsection (11) pertains to actions performed by persons other than the direct discharger. For Example, a consultant or laboratory that collects and /or analyses samples for a direct discharger has in effect carried out the obligations of that direct discharger.

Subsection (12) states that each sample collected from a process effluent sampling point or combined effluent sampling point will be a composite sample as outlined in the General Effluent Monitoring Regulation.

Subsection (13) states that the sampling and flow measurement obligations for cooling water effluent will be carried out in accordance with the methods specified in the General Effluent Monitoring Regulation for once-through cooling water.

Subsection (14) states that the installation of a rain gauge is not required at plants which are not required to report storm events.

SECTION 4: SAMPLING POINTS

Subsection (1) states that each direct discharger must establish by January 8, 1990, a sampling point on each effluent stream named in the site specific monitoring schedule for that discharger's plant.

The effluent streams regulated in the Metal Casting Sector Regulation are:

1. Combined effluent streams
2. Cooling water effluent streams
3. Process effluent streams
4. Storm water effluent streams

Subsection (2) states that the sampling points established under subsection (1) must be used for all sampling required by the Regulation unless an alternate sampling location is deemed acceptable by the Regional Director.

Subsection (3) states that sets of samples need not be collected on the same day as one unless there is a specific requirement in the Regulation for such collection.

SECTION 5: CHARACTERIZATION AND OPEN CHARACTERIZATION

Characterization and open characterization samples must be collected and analyzed according to the principles and protocols outlined in sections 3 and 4 of the General Regulation for sampling and analysis respectively.

The site-specific monitoring schedules for each direct discharger indicate the required frequencies and minimum sampling interval for performing characterization and open characterization.

For the purpose of characterization, the metal casting sector has been divided into two groups :

1. Plants that discharge process effluent streams, combined effluent streams and cooling water with a potential for contamination.

2. Plants that discharge only cooling water.

Characterization and open characterization for process effluent streams, combined effluent streams and cooling water effluent stream with a potential for contamination are required to be conducted once in each quarter.

Plants that discharge only cooling water are not required to carry out characterization nor open characterization. Cooling water for these plants is not used to cool process streams but is used to cool die casting machines, shell core molding machine parts, air compressors and hydraulic oil. The potential for contamination of these type of cooling water is extremely limited.

All process effluent streams and selected combined effluent streams will be analyzed for all parameters on Schedule AA which includes ATGs 1 through 27 with the exception of ATGs 21 and 22, herbicides and pesticides. Analytical test groups 21 and 22 are not generated during metal casting processes.

All cooling water effluent streams with a potential for contamination and selected combined effluent streams (mainly from plants with a small quantity of flows) will be analyzed for all parameters in Schedule BB which includes ATGs 1 through 20 and 25 through 27. Analytical test groups 21, 22 and 23 were not detected in these effluent during the pre-regulation monitoring program.

The Regulation requires that there be a sixty days between the collection of samples from the same effluent sampling point in order that representative data on different operating conditions is collected.

Monitoring for ATG 24, chlorinated dibenzo-p-dioxins and dibenzofurans, is required semi-annually with a sampling interval of 180 days, at selected process and combined effluent streams.

Characterization and open characterization is required after each process change which may affect the chemical composition of the effluent.

SECTION 6: DAILY MONITORING - PROCESS EFFLUENT AND COMBINED EFFLUENT

All process and some combined effluent streams, as designated in the monitoring schedules, have daily monitoring requirements. The parameters required to be monitored daily are:-

-	Group 3	Hydrogen Ion (pH);
-	Group 7	Specific Conductance;
-	Group 8	Suspended Solids; and
-	Group 14	Phenolics (4AAP).

SECTION 7: THRICE WEEKLY MONITORING - PROCESS EFFLUENT AND COMBINED EFFLUENT

All process and combined effluent streams, as designated in the monitoring schedules, have thrice weekly monitoring requirements. The parameters required to be monitored thrice weekly are:

-	Group 1	Chemical Oxygen Demand;
-	Group 4a	Ammonia plus Ammonium;
-	Group 9	Total Metals;
-	Group 11	Chromium (Hexavalent);
-	Group 25	Oil and Grease;
-	Group MC1	Metals (Iron and Magnesium); and
-	Group MC2	Fluoride.

Group 11 is required to be monitored thrice weekly only if total chromium exceeds 1 mg/l.

SECTION 8: WEEKLY MONITORING - PROCESS EFFLUENT AND COMBINED EFFLUENT

Process effluent and combined effluent streams will be monitored Weekly for some or all of the following parameters :

- Chemical Oxygen Demand,
- Hydrogen ion (pH),
- Total Suspended Solids,
- Dissolved Organic Carbon,
- Total Phosphorus,
- Phenolics (4AAP),
- Oil and Grease
- Phenanthrene
- Naphthalene

A minimum of two days between consecutive weekly samples is required in order to avoid sample correlation and thus, increase sample randomness.

SECTION 9: MONTHLY MONITORING - PROCESS EFFLUENT AND COMBINED EFFLUENT

Process effluent and combined effluent streams will be monitored monthly for some or all of the following analytical test groups:

-	Group 2	Cyanide;
-	Group 12	Mercury;
-	Group 13	Total Alkyl Lead;
-	Group 15	Sulphide;
-	Group 16	Volatiles, Halogenated;
-	Group 17	Volatiles, Non-Halogenated;
-	Group 18	Volatiles, Water Soluble;
-	Group 19	Extractables, Base Neutral;
-	Group 20	Extractables, Acid (Phenolics);
-	Group 26	Fatty and Resin Acids; and
-	Group 27	PCBs (Total).

An interval of two weeks between successive monthly samples is required in order to provide independent samples over as wide a range of operating conditions as possible.

SECTION 10: MONTHLY MONITORING - COOLING WATER

Plants that discharge cooling water or cooling water with potential for contamination are required to monitor for some or all of the following analytical test groups on monthly basis:

- Group 3	Hydrogen Ion (pH);
- Group 5a	Dissolved Organic Carbon;
- Group 8	Total Suspended Solids;
- Group 9	Total Metals;
- Group 11	Hexavalent Chromium
- Group 13	Toatal Alkyl Lead
- Group 14	Total Phenolics (4AAP);
- Group 25	Oil and Grease;
- Group MC1	Iron and Magnesium;
- Group MC2	Fluoride

PCBs will be monitored quarterly if they are stored on site.

SECTION 11: MONTHLY MONITORING - STORM WATER

A total of 12 samples are required during discharges of storm water at each affected storm water sampling point. In cases where samples cannot be collected from a storm water sampling point because of a lack of sufficient volume of discharge, an additional set of samples must be collected during a subsequent storm event or thaw in the following month in order to provide a total of 12 data points.

The list of parameters to be analyzed reflect those that may potentially contaminate the storm water effluent either through continually occurring spills to the collection system or by run-off from material storage areas. Some or all of the following parameters are included in the monitoring of storm water:

- Chemical Oxygen Demand
- Total Cyanide
- Ammonia plus Ammonium
- Nitrate plus Nitrite
- Dissolved Organic Carbon;
- Total Phosphorus
- Total Suspended Solids;
- Total Metals;
- Hexavalent Chromium
- Total Alkyl Lead
- Total Phenolics (4AAP);
- Sulphide
- Oil and Grease;
- Iron and Magnesium
- Fluorides

SECTION 12: QUALITY CONTROL MONITORING

Quality control monitoring include the sampling and analyses of duplicate, travelling blank and travelling spiked blank samples. These samples provide information about the quality of the effluent samples collected and whether contamination, either during sampling or transportation, has occurred.

Process and combined effluents will require field quality control samples as these effluents will be extensively monitored. Information obtained from the quality control samples will be used to assess effects of sampling methods and transportation of samples.

Monthly quality control monitoring of one process effluent stream is required for those parameters which are analyzed on a daily and thrice weekly basis. These quality control samples are collected on the same days as the daily and thrice weekly samples specified in sections 6 and 7 respectively.

Quarterly quality control monitoring of one process effluent stream is required for those parameters which are analyzed on a weekly and monthly basis. The quality control samples are collected on the same day as the weekly and monthly samples specified in sections 8 and 9.

A duplicate sample provides a measure of the reproducibility of sampling techniques used at the site including the integrity of the sample containers.

A travelling blank sample will provide an indication of any problems with sample contamination due to extraneous volatile fractions of contaminants in the atmosphere and any contaminants introduced by handling of the sample containers. Analytical test groups 1 (COD), 3 (pH) and 8 (TSS/VSS) are excluded from the analyses.

Travelling blanks for COD and TSS/VSS are relatively ineffective. Gross contamination would be required to be detected at the ppm levels of detection for these tests. No information relevant to samples is to be gained for pH on a travelling blank of distilled water.

A travelling spiked blank sample should provide an indication of the degree of degradation of the target parameters from the time it is sampled to the time it is analyzed, which in turn may indicate degradation of the target parameters in the effluent sample itself. Only analytical test groups 16 to 23 and 26 are to be analyzed as they are most likely to volatilize or degrade in the unpreserved solution.

Travelling spiked blanks are not required for the conventional parameters and total metals. Inorganic parameters in samples are stable. Most of the samples are either preserved or are analyzed within very short time periods.

The travelling spiked blank samples must be prepared with a standard solution which contains all of the parameters in the analytical test groups for which the analyses are required.

Additional quality control samples are to be prepared and analyzed by the laboratory, as outlined in section 4 of the General Regulation. These samples will provide an indication of analytical variability and laboratory contamination due to the analytical procedures.

SECTION 13: TOXICITY TESTING

Section 5 of the General Regulation specifies the test protocols which must be followed for the fish toxicity test and the Daphnia magna acute lethality toxicity test. The test protocols are published in the following Ministry of the Environment documents:

- "Protocol to Determine the Acute Lethality of Liquid Effluent to Fish", dated July 1983; and
- "Daphnia magna Acute Lethality Toxicity Test Protocol" dated April 1988.

Toxicity test samples are to be collected at each effluent sampling point designated for toxicity testing in the site-specific monitoring schedules at the frequency specified in that schedule.

Monthly samples, required for process and combined effluent streams, must be collected on the same day as the routine monthly monitoring samples for that same effluent stream in order to aid in the interpretation and possible correlation of the chemical analyses and the resultant biological effects.

Effluent samples used for the fish toxicity and Daphnia magna tests are to be taken from the same sample container or set of containers in order to minimize the likelihood of sample differences.

In the case where three monthly fish toxicity tests result in mortality for no more than 20% of the population at each effluent concentration in the serial dilution, toxicity tests may be performed on 100 percent undiluted test solutions for the subsequent fish toxicity tests.

Full series dilution LC50 fish toxicity testing would resume for a given stream if any one of the single concentration tests on full strength effluent only showed mortality above 20%.

It is not unusual for one fish in a sample to suffer mortality due to natural causes. Therefore, mortality greater than two fish in most cases would be an indication of some effluent lethality.

Daphnia magna acute lethality test will be performed monthly using full series dilutions.

Quarterly toxicity tests using both the fish toxicity test and Daphnia magna acute lethality test are required for selected combined effluent streams and cooling water effluent streams with a potential for contamination. Quarterly samples must be collected on the same day as the monthly samples for these effluent streams.

The single concentration fish toxicity test on full strength effluent is not applicable to the quarterly toxicity tests.

SECTION 14: FLOW MEASUREMENT

Protocols and procedures for flow measurement are outlined in section 6 of the General Regulation.

Flow measurement accuracy requirements are a function of stream type. A flow measurement accuracy of plus or minus 5% of the actual flow for primary devices and plus or minus 2% of full scale flow for secondary devices is required for all process effluent streams to be measured by new flow measurement devices. This accuracy is required to establish accurate loadings on those streams. A flow measurement accuracy of not greater than plus or minus 15% is allowed for existing flow measurement devices.

Combined effluent streams are required to be continuously measured within an accuracy of plus or minus 20%. This is required to quantify the contaminant loadings from sources other than the main process effluent which is monitored separately.

Cooling water and storm water effluent streams are required to be calculated, estimated or measured within an accuracy of plus or minus 20%. This accuracy applies to the total volume of cooling water discharged in the sampling day and the total volume of storm water discharged from the monitored storm event. The duration of each monitored storm event must also be measured and recorded.

Flow measurement requires the use of primary and secondary flow measurement devices. Typical primary flow measurement devices are:

- parshall flumes;
- weirs;
- orifice plates;
- mag meters;
- venturi meters.

Typical secondary flow measurement devices are electronic interfaces with the primary devices which interpret the measurements and convert them to usable flow data. These data are commonly presented in a continuous chart form or discrete readout. A continuous chart is preferred to provide a record of the flow variability.

The General Regulation requires that good maintenance practices be followed for all flow measurement devices and that calibration of these measurement devices be carried out periodically.

SECTION 15: EXTENDED MONITORING - WEEKLY

Section 15 comes into force on May 1, 1991, following the initial one year monitoring period and will continue for a period of one year. The extended monitoring applies only to plants with process and/or combined effluent streams.

The parameters required to be monitored weekly under the extended monitoring program are those parameters required to be monitored on daily, thrice weekly and weekly basis during the first year.

SECTION 16: REPORTING

Section 7 of the General Regulation outlines the reporting requirements for each direct discharger. Each direct discharger is required to submit an Initial Report to the Regional Director by February 8, 1989.

The contents of the Initial Report are outlined in the General Regulation. All information which is considered by the plant to be confidential business information must be so identified on each such page submitted to the Ministry.

This report is intended to provide the Ministry with a clear understanding of plant processes and the procedures each plant will follow in carrying out the requirements of this Regulation. Four copies of the Initial Report, including any attachments, should be provided.

A guidance document will be available from the Ministry prior to promulgation of the Metal Casting Sector Regulation to provide assistance in preparing the Initial Report.

Results from all analyses performed by the laboratory must be reported, including all positive numerical values at or above the laboratory calculated method detection limit.
In those cases where a laboratory has a method detection limit lower than the maximum allowed by the Regulation, all positive values below the MISA method detection limit must be reported.

Flow measurement information must be reported for all process effluent, combined effluent and cooling water effluent streams.
The duration and approximate volume of discharge of storm water, is to be reported.

A schedule of the sampling dates and times for monthly and characterization sampling is required for Ministry inspection purposes. Inspection samples will be collected for the Ministry concurrent with the collection of samples by the plant site.
Sampling procedures used at the plant will also be checked during Ministry inspections.

Plants with process effluent streams, combined effluent streams and/or cooling water effluent streams with a potential for contamination are required to install rain gauges and to report the date, approximate duration and amount of rainfall of each storm event during the monitoring period of the Regulation. Information on the amount of rainfall will provide insight into the effect of rain on the quality and quantity of effluent streams monitored. A heavy rainfall or a succession of storm events may lead to dilution of these effluent streams and may thereby impact on the analytical results.

The quantities of chemicals added to cooling water are required in order to provide a greater understanding of the potential and degree of contamination. Routine monitoring of cooling water is designed to identify long-term leaks from process streams.

A flow variability report, as specified in subsection 3(5) of the General Regulation, is required for each process effluent stream from which samples were collected other than by means of an automatic flow proportional composite sampling device. This report is intended to be used by the plant to show that the effluent flow is non-variable and therefore would not require flow proportional sampling for further collection of samples.

Failure to provide a flow variability report will result in designation of the effluent stream as a variable flow stream requiring flow proportional sampling.

A report detailing any equipment malfunctions or any other problems which interfere with carrying out the requirements of both the General and Metal Casting Sector Regulations, and the remedial action taken, must be provided. The reasons for non-compliance with the requirements, as documented in this report, may be taken into consideration by abatement and enforcement staff investigating an act of non-compliance.

All other records which are required to be kept by this section are primarily for inspection purposes to ensure compliance with this Regulation. The records should be kept for a period of two years beyond the submission of the last report in compliance with the requirements of the Metal Casting Sector Regulation.

SECTION 17: COMMENCEMENT

The Initial Report is required by February 8, 1990.

Routine monitoring requirements, including daily, thrice weekly, weekly, monthly, characterization, toxicity testing and reporting requirements, will come into force on May 1, 1990.

The five month implementation period is intended to provide sufficient time to allow the plant site to purchase and install equipments, negotiate contracts with laboratories, set up their monitoring programs and train personnel.

Each process and combined effluent stream will be monitored weekly starting May 1, 1991. This weekly monitoring requirement will include those parameters that are monitored daily, thrice weekly and weekly during the first year of monitoring.

The weekly monitoring will be conducted according to the principles and protocols for both sampling and flow measurement stated in the General Effluent Monitoring Regulation and this Regulation.

SECTION 18: REVOCATION

With the exception of the extended weekly monitoring (section 15) and flow measurement requirements i.e. subsections 14(1) to (4), the Metal Casting Effluent Monitoring Regulation will be revoked on May 1, 1991. Section 15 and subsection 14(1) to (4) will be revoked on May 1, 1992.